TWIN DISC
INCORPORATED

Service Manual

Marine Transmission

Components:
MG-6619SC

Document Number: 1021654

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Marine Transmission Service Manual

TWIN DISC, INCORPORATED
EXCLUSIVE LIMITED WARRANTY
COMMERCIAL MARINE TRANSMISSION

A. Twin Disc, Incorporated warrants all assembled products and parts, (except component products or parts on which written warranties issued by the respective manufacturers thereof are furnished to the original customer, as to which Twin Disc, Incorporated makes no warranty and assumes no liability) against defective materials or workmanship *for a period of twenty-four (24) months from the date of shipment by Twin Disc, Incorporated to original customer, but not to exceed twelve (12) months of service, whichever occurs first.* **This is the only warranty made by Twin Disc, Incorporated and is in lieu of any and all other warranties, express or implied, including the warranties of merchantability or fitness for a particular purpose and no other warranties are implied or intended to be given by Twin Disc, Incorporated.** The original customer does not rely upon any tests or inspections by Twin Disc, Incorporated or on Twin Disc, Incorporated*s application engineering.

B. **The exclusive remedy provided by Twin Disc, Incorporated whether arising out of warranty within the applicable warranty period as specified, or otherwise (including tort liability), shall at the sole option of Twin Disc, Incorporated be either the repair or replacement of any Twin Disc, Incorporated part or product found by Twin Disc, Incorporated to be defective and the labor to perform that work and to remove and reinstall (or equivalent credit). In this context, labor is defined as the flat rate labor hours established by Twin Disc, Incorporated in the published Twin Disc Flat Rate Schedule, required to remove, disassemble, inspect, repair, reassemble, reinstall and test the Twin Disc, Incorporated product only. Authorized reasonable travel and living expenses will be considered for payment. Under no circumstances, including a failure of the exclusive remedy, shall Twin Disc, Incorporated be liable for economic loss, consequential, incidental or punitive damages.** The above warranty and remedy are subject to the following terms and conditions:

1. Complete parts or products upon request must be returned transportation prepaid and also the claims submitted to Twin Disc, Incorporated within sixty (60) days after completion of the in-warranty repair.

2. The warranty is void if, in the opinion of Twin Disc, Incorporated, the failure of the part or product resulted from abuse, neglect, improper maintenance or accident.

3. The warranty is void if any modifications are made to any product or part without the prior written consent of Twin Disc, Incorporated.

4. The warranty is void unless the product or part is properly transported, stored and cared for from the date of shipment to the date placed in service.

5. The warranty is void unless the product or part is properly installed and maintained within the rated capacity of the product or part with installations properly engineered and in accordance with the practices, methods and instructions approved or provided by Twin Disc, Incorporated.

6. The warranty is void unless all required replacement parts or products are of Twin Disc origin or equal, and otherwise identical with components of the original equipment. Replacement parts or products not of Twin Disc origin are not warranted by Twin Disc, Incorporated.

C. As consideration for this warranty, the original customer and subsequent purchaser agree to indemnify and hold Twin Disc, Incorporated harmless from and against all and any loss, liability, damages or expenses for injury to persons or property, including without limitation, the original customer*s and subsequent purchaser*s employees and property, due to their acts or omissions or the acts or omissions of their agents, and employees in the installation, transportation, maintenance, use and operation of said equipment.

D. Only a Twin Disc, Incorporated authorized factory representative shall have authority to assume any cost or expense in the service, repair or replacement of any part or product within the warranty period, except when such cost or expense is authorized in advance in writing by Twin Disc, Incorporated.

E. Twin Disc, Incorporated reserves the right to improve the product through changes in design or materials without being obligated to incorporate such changes in products of prior manufacture. The original customer and subsequent purchasers will not use any such changes as evidence of insufficiency or inadequacy of prior designs or materials.

F. If failure occurs within the warranty period, and constitutes a breach of warranty, repair or replacement parts will be furnished on a no-charge basis and these parts will be covered by the remainder of the unexpired warranty which remains in effect on the complete unit.

TWIN DISC, INCORPORATED
FLAT RATE HOUR ALLOWANCE

(Hourly Labor Rate Must be Acceptable to Twin Disc, Incorporated.)

COMMERCIAL MARINE TRANSMISSIONS - ALL RATIOS:

MODEL SERIES	R&R	UNIT REBUILD	CLUTCH REPAIR (BOTH PACKS)
MG 502, MG 5010, MG5011, MG5005A MG5015A	10.0	8.0	-
MG 506, MG5061, MG 5050, MG5055A	10.0	11.0	-
MG 507, MG 5081, MG5085, MG5090,	10.0	12.0	-
MG 5091	10.0	12.0	4.0
MG5112,MG5113	10.0	17.0	-
MG 509, MG 5111, MG5114	10.0	17.0	4.0
MG5114A, MG5114RV	10.0	17.0	-
MG 514C, MG514M, MG5141, MG514CHP	10.0	25.0	6.0
MG 516, MG 5161	10.0	28.0	8.0
MG 518-1	10.0	32.0	10.0
MG520-1, MG 5202, MG5203, MG5204 MG5205, MG5222, MG5225	10.0	32.0	10.0
MG 530, MG530M, MG5301	12.0	32.0	16.0
MG 540	20.0	62.0	20.0
MG5600	20.0	62.0	20.0
MG6000	10.0	32.0	10.0
MGN80, MGN232, MGN233, MGN272, MGN273, MGN332, MGN334, MGN335, MGN432, MGN433, MGN472, MGN493	10.0	32.0	10.0
MGN650, MGN800,MGN1000,MGN1400, MGN1600	20.0	62.0	40.0
PUMP - ALL MODELS	1.0	-	
VALVE - ALL MODELS:	1.0	.5	

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Introduction

General Information

This publication provides service information for the Twin Disc MG-6619SC marine transmission. Specific engineering details and performance characteristics can be obtained from the Product Service Department of Twin Disc, Incorporated, Racine, Wisconsin, USA.

Operation and maintenance personnel responsible for this equipment should be familiar with this publication and have it at their disposal. A thorough understanding and application of the material in this manual will result in consistent performance from the unit and help reduce downtime.

Safety and General Precautions

General

All personnel servicing this equipment should employ safe operating practices. Twin Disc, Inc. will not be responsible for personal injury resulting from careless use of hand tools, lifting equipment, power tools, or unaccepted maintenance/working practices.

Important Safety Notice

Proper installation, maintenance, and operation procedures must be followed due to the possible danger to person(s) or property from accidents that may result from the use of machinery. Twin Disc, Inc. will not be responsible for personal injury resulting from careless maintenance/working practices.

Inspect as necessary to assure safe operations under prevailing conditions. Proper guards and other safety devices that may be specified in safety codes should be provided. These devices are neither provided by, nor are they the responsibility of Twin Disc, Inc.

⚠ WARNING

Selecting NEUTRAL disengages transmission clutches but does not prevent propeller shaft rotation. If you require positive neutral (propeller shaft locked), a shaft brake or other shaft-locking device must be used.

⚠ WARNING

To prevent accidental starting of the engine when performing routine transmission maintenance, disconnect the battery cables from the battery and remove ignition key from the switch.

⚠ WARNING

Most Twin Disc products have provisions for attaching lifting bolts. The holes provided are always of adequate size and number to safely lift the Twin Disc product. These lifting points must not be used to lift the complete power unit. Lifting excessive loads at these points could cause failure at the lift point (or points) and result in damage or personal injury.

⚠ CAUTION

Select lifting eyebolts to obtain maximum thread engagement with bolt shoulder tight against housing. Bolts should be near but should not contact bottom of bolt hole.

Preventative Maintenance

Frequent reference to the information provided in the Marine Transmission Operator's Manual, 1016313, regarding daily operation and limitations of this equipment will assist in obtaining trouble-free operation. Schedules are provided for recommended maintenance of the equipment.

Towing

⚠ WARNING

Under the conditions described below, the prop shaft must be locked in place to prevent backdriving. Failure to do this can damage the marine transmission due to the lack of component lubrication.

Backdriving (also called windmilling) occurs when an engine is shut down and the propeller shaft is being driven by the flow of water across the propeller, which, in turn, rotates the components in the marine transmission. During backdriving conditions, the transmission does not receive proper lubrication.

Conditions where Backdriving May Occur:

- ❑ Vessel is being towed.
- ❑ One or more engines on a multiple-transmission vessel are shut down while under way.
- ❑ Sailboat under sail with auxiliary engine shut down.
- ❑ Vessel tied up or docked in a heavy current.

The Following Solutions are Applicable for All MG-6619SC Transmissions if any of the Above Conditions are Present:

- ❑ Lock the propeller shaft to prevent rotation.
- ❑ Add an optional trailing oil pump into the lubrication circuit.

Refer to the hydraulic system prints for more details on the optional trailing pump specifications for the applicable transmission, or contact your Twin Disc Authorized Distributor.

Ordering Parts and Obtaining Services

⚠ WARNING

All replacement parts or products (including hoses and fittings) must be of Twin Disc origin or equal, and otherwise identical with components of the original equipment. Use of any other parts or products will void the warranty and may result in malfunction or accident, causing injury to personnel and/or serious damage to the equipment.

Ordering Service Parts

Renewal parts, service parts kits, optional equipment and product service assistance may be obtained from any authorized Twin Disc distributor or service dealer. Contact Twin Disc for the distributor or service dealer near you.

Note: Do not order parts from the part numbers on the cross-sectional drawings. These numbers may be referenced for part identification; however, they should be verified on the bill of material (BOM) before an order is placed. BOM numbers are stamped on the unit nameplate.

Twin Disc, having stipulated the bill of material number on the unit's nameplate, absolves itself of any responsibility resulting from any external, internal, or installation changes made in the field without the express written approval of Twin Disc. All returned parts, new or old, emanating from any of the above stated changes will not be accepted for credit. Furthermore, any equipment that has been subjected to such changes will not be covered by a Twin Disc warranty.

Source of Service Information

For the latest service information on Twin Disc products, contact any Twin Disc distributor or service dealer. This can be done on the Twin Disc corporate web site found at [http://www.twindisc.com]. Provide your model number, serial number and bill of material number to obtain information on your unit. If necessary, contact the Product Service Department, Twin Disc, Incorporated, Racine, Wisconsin 53405-3698, USA by e-mail at service@twindisc.com.

Warranty

Equipment for which this manual was written has a limited warranty. For details of the warranty, refer to the warranty statement at the front of this manual. For details of the warranty, contact any Twin Disc Authorized Distributor, service dealer, or the Warranty Administration Department, Twin Disc, Inc., Racine, Wisconsin, U.S.A.

Description and Specifications

General

The 7-39208 and 7-37449 drawings identify the installation information for the MG-6619SC marine transmission. This unit is only available as an engine mounted unit that attaches directly to the engine flywheel housing. The output shaft is parallel to the input shaft.

Nameplate

The nameplate identifies the model, bill of material (BOM) and the serial number of the unit. These numbers are necessary to identify the correct parts for your transmission.

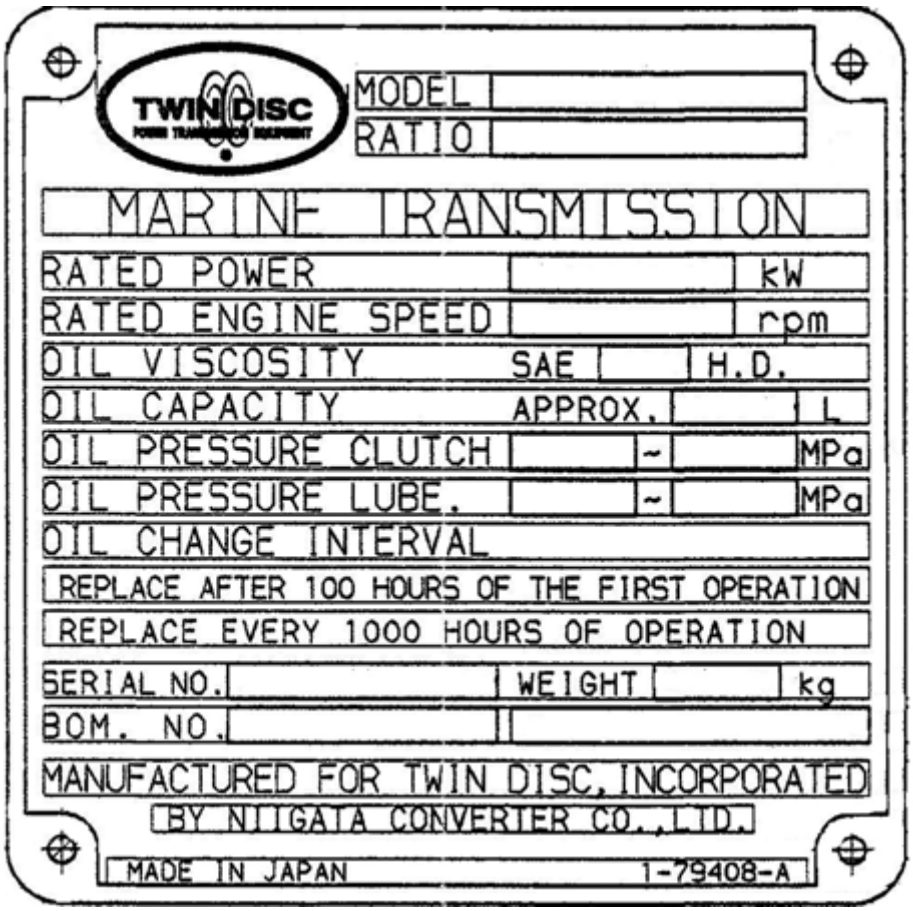

Figure 1. Nameplate for MG-6619SC Marine Transmission

Power Ratings

The MG-6619SC transmissions can be operated through either the primary shaft or secondary shaft at its full rated horsepower when driven by a standard right hand rotation engine (counterclockwise flywheel rotation when viewing rear of engine). This series of marine transmissions can be driven by a left hand rotation engine. Contact an authorized Twin Disc distributor for more information.

Transmission clutches are hydraulically applied using main oil pressure. All bearings, clutches and gears are lubricated and cooled with low-pressure oil.

Always reference the Bill of Materials (BOM) or Specification Number when ordering service parts.

Construction Features

Housings

The MG-6619SC series transmission has a two-piece main housing. Front housings in sizes SAE No. 1 and SAE No. 0 are available. Top covers and a manifold complete the housing enclosure. The pump mounts on the secondary shaft, and the primary shaft has a cover.

Bearings

The primary and secondary clutch shafts are supported and located by tapered roller bearings. The pinions are supported on bushings and the end movement limited by thrust washers. Bearing clearances for each clutch shaft are set by use of a single shim pack at the rear-tapered roller bearing on each shaft. Tapered roller bearings and a spherical roller bearing support the output shaft and have bearing clearance adjusted by use of shims at the front bearing retainer.

Oil Pump and Drive

The oil pump is spline driven by the secondary clutch shaft.

Lubrication Features

The MG-6619SC transmission bearings and clutches on the primary and secondary shafts are lubricated through oil passages drilled in the shafts. The output shaft bearings, transfer gears, primary and secondary pinions and their bearings are gravity and splash lubricated.

Suction Screen

The marine transmission has a serviceable suction strainer located below the oil pump. The strainer is between the sump and oil pump in the hydraulic circuit. The strainer can be replaced if necessary.

Filter Assembly

A canister-style filter is located between the oil pump outlet and the selector valve in the hydraulic circuit. The replacement element should be replaced at 1000 hour or six month intervals, whichever comes first. The replacement filter part number is N144200000.

Gears

All gears are helical, carburized, hardened and skived or ground for smooth quiet operation. All gears are in constant mesh. The primary and secondary transfer gears/clutch spiders are shrunk-fit onto the primary and secondary shafts. Removal of these gears is not recommended during service. The output gear is mounted on a keyless taper.

Flexible Torsional Input Coupling

The purpose of the torsional coupling is to transmit power from the engine to the marine transmission through a rubber or silicone element that will:

- ❑ Dampen torsional vibrations
- ❑ Change the natural frequencies of a system to move critical frequencies out of the operating speed range
- ❑ Accommodate a certain amount of misalignment
- ❑ Absorb shock and reduce noise
- ❑ Minimize gear “rattle”

The coupling has been selected based on the customer supplied engine information. Final coupling selection must be confirmed by the packager based on the torque/rpm ratings and the results of the system torsional vibration analysis (TVA), and on engine rotation. Care must be taken when servicing that replacement couplings are matched to this criteria.

Heat Exchanger

The heat exchanger is designed to maintain the oil in the hydraulic system of the marine transmission at the proper temperature by passing raw or fresh water through the heat exchanger. The heat exchanger is located in the transmission housing. Replaceable zincs for corrosion protection are located on the heat exchanger end caps.

Specifications

Maximum operating speed: 2500 rpm

Operating oil sump temperature: 65-70° C (149-158° F) when using SAE 40 oil

Oil type and viscosity: See nameplate below.

Oil capacity: 22 liters (5.8 gal)

Approximate Dry weight: 505 kg (1113 lb)

Oil pressure: See Table 1. Oil temperature to be in normal operating range.

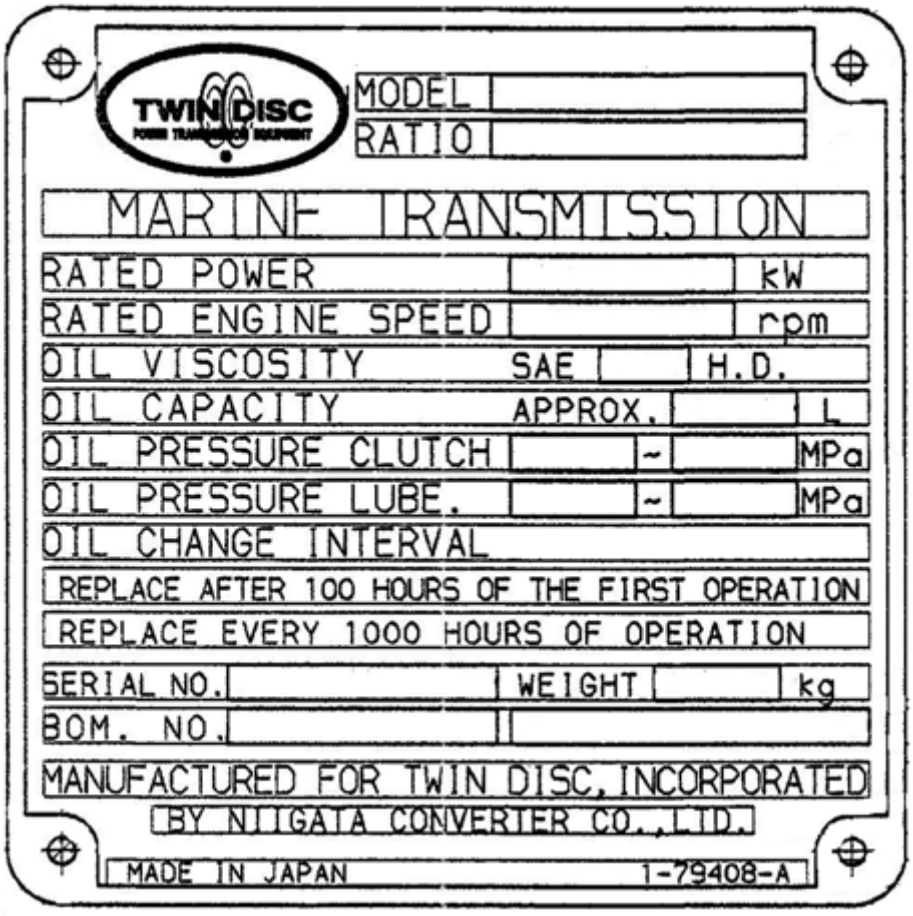

Figure 2. Nameplate with Oil Specification

Table 1. 2351-2551 kPa (341-370 psi) Transmission Oil Pressure Specifications

Control Valve - 2351-2551 kPa (321-370 psi) Springs									
Input Speed	Shift Position	Main Pressure at Valve Inlet		Primary Clutch Min.		Secondary Clutch Min.		Lube	
		kPa	psi	kPa	psi	kPa	psi	kPa	psi
600	Neutral	255-310	37-45	0	0	0	0	19 min	2.8 min
600	Primary	786-2551	114-370	786	114	0	0	19 min	2.8 min
600	Secondary	786-2551	114-370	0	0	786	114	19 min	2.8 min
2100	Neutral	490-1179	71-171	0	0	0	0	193-586	28-100
2100	Primary	2351-2551	341-370	2351	341	0	0	193-586	28-100
2100	Secondary	2351-2551	341-370	0	0	2351	341	193-586	28-100

Note: It is required that primary and secondary clutches must be within 97 kPa (14 psi) of each other.

Note: Some early production units operated with lower oil pressures. The following table applies to these units only.

Table 2. 2255-2455 kPa (327-356 psi) Transmission Oil Pressure Specifications

Control Valve - 2255-2455 kPa (327-356 psi) Springs									
Input Speed	Shift Position	Main Pressure at Valve Inlet		Primary Clutch Min.		Secondary Clutch Min.		Lube	
		kPa	psi	kPa	psi	kPa	psi	kPa	psi
600	Neutral	255-310	37-45	0	0	0	0	19 min	2.8 min
600	Primary	786-2455	114-370	786	114	0	0	19 min	2.8 min
600	Secondary	786-2455	114-356	0	0	786	114	19 min	2.8 min
2100	Neutral	490-1179	71-171	0	0	0	0	193-586	28-100
2100	Primary	2255-2455	327-356	2255	327	0	0	193-586	28-100
2100	Secondary	2255-2455	327-356	0	0	2255	327	193-586	28-100

Optional Equipment

The following optional equipment for use with the model MG-6619SC is available through the nearest authorized Twin Disc distributor.

Optional Trailing Pump

A trailing pump kit is available that bolts onto the rear of the marine transmission. A drawing is included in the Engineering Drawings.

Power Take-off

A live Pump Mount power take-off and a hydraulically clutchable power take-off are available and mount on the rear of the transmission. They rotate at the same speed and direction as the engine.

Mounting Brackets

Fabricated mounting brackets are available.

Torsional Input Coupling

Several models of torsional input couplings are available.

Electric Control Valve

Electric control valve are standard with either 12 vdc or 24 vdc actuating solenoids.

Coupling Flange

A coupling companion flange is available.

Trolling Valve

A mechanical trolling valve is available for mounting on the electric control valve.

Table 3. Bearing End Play Specifications

Transmission Primary and Secondary Shaft Tapered Roller Bearing Endplay		
Assembly No.	**Minimum**	**Maximum**
All	-0.05 mm (-0.002 in)	+0.05 mm (+0.002 in)
Transmission Output Shaft Bearing Endplay		
Assembly No.	**Minimum**	**Maximum**
All	0.00 mm (.000 in)	+0.05 mm (+0.002 in)

Note: A negative endplay indicates a pre-load condition.

Table 4. Front Housing and Output Flange Runout Limits

Feature	Maximum allowable total indicator reading
SAE #1 front housing face	0.30 mm (.012 in)
SAE #0 front housing face	0.41 mm (.016 in
SAE #1 front housing pilot diameter	*0.30 mm (.012 in)
SAE #0 front housing pilot diameter	*0.41 mm (.016 in)
Output flange face near O.D.	0.10 mm (.004 in)
Output flange pilot diameter	0.10 mm (.004 in)
*This note applies to a continuous 270° arc if the balance of the pilot is negative in readings; otherwise it means all 360°	

Torque Values for Fasteners

Note: All threads and bearing face to be lubricated with light oil film prior to assembly.

Note: Use grade 5 and Property Class 8.8 specs when threading into aluminum.

Table 5. Metric Coarse Thread Capscrews, Bolts, and Nuts

Thread Size	Property Class 8.8		Property Class 10.9		Property Class 12.9	
	Lb•ft	N•m	Lb•ft	N•m	Lb•ft	N•m
M6	6.5-7.5	9-10	9-10	12-14	10-12	14-16
M8	16-18	21-25	23-26	31-35	25-29	34-40
M10	32-36	43-49	44-51	60-68	51-59	70-80
M12	55-63	74-86	77-88	104-120	89-103	121-139
M16	132-151	179-205	189-217	256-294	219-253	298-342
M20	257-295	348-400	364-418	493-567	429-493	581-669
M24	445-511	603-693	626-720	848-976	737-848	1000-1150
M30	714-820	987-1113	1235-1421	1674-1926	1475-1697	2000-2301

Table 6. Metric Stainless Steel Capscrews, Bolts, and Nuts

Note: The use of nickel anti-seize compound is required to prevent corrosion due to galvanic action. Apply nickel anti-seize compound to the threads of these stainless steel fasteners before torquing to specification. See Standard Sheet S574B for a more complete listing of stainless steel fastener torque values.

Metric Coarse Thread Stainless Steel Capscrews, Bolts, and Nuts	
Thread Size	**Recommended Torque N-m (Lb$_f$-ft)**
M8	12 (8.5)
M10	24 (18)
M12	40 (30)
M14	63 (46)
M16	97 (72)

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Table 7. Tapered Pipe Plugs (with thread lubricant)

Torque Values for Lubricated Pipe Plugs Recommended Torque in N-m (Lbf-ft)			
PT Size	**NPTF** Size	**Installed in Cast Iron or Steel**	**Installed in Aluminum**
1/16 - 28	1/16 - 27	11.5 ± 1.3 (8.5 ± 1.0)	7.5±0.9 (5.5±0.7)
1/8 - 28	1/8 - 27	14.2 ± 1.8 (10.5 ± 1.3)	8.8 ± 1.1 (6.5 ± 0.8)
1/4 - 19	1/4 - 18	34 ± 4 (25 ± 3)	22 ± 3 (16 ± 2)
3/8 - 19	3/8 - 18	37 ± 4 (27 ± 3)	23 ± 3 (17 ± 2)
1/2 - 14	1/2 - 14	68 ± 8 (50 ± 6)	41 ± 5 (30 ± 4)
3/4 - 14	3/4 - 14	73 ± 10 (54 ± 7)	46 ± 5 (34 ± 4)
1 - 11	1 - 11-1/2	109 ± 13 (80 ± 10)	68 ± 8 (50 ± 6)
1-1/4 - 11	1-1/4 - 11-1/2	115 ± 13 (85 ± 10)	75 ± 9 (55 ± 7)
1-1/2 - 11	1-1/2 - 11-1/2	115 ± 13 (85 ± 10)	75 ± 9 (55 ± 7)

Notes:

The lubricant is to be John Crane insoluble plastic lead seal No. 2 (or equivalent), or Loctite® No. 92 (or equivalent) and plugs are to be capable of removal without damage. Overtightening may cause initial leakage, plus potential removal damage.

An option of a maximum of two full turns after finger tightening the plug may be used if required and if removal conditions are met.

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Table 8. Straight Threaded Tube Fittings, Hose Fittings, and O-ring Plugs

Nominal Thread Diameter	Nm + or - 5 %	lb-ft + or - 5 %	Nominal Thread Diameter	Nm + or - 5 %	lb-ft + or - 5 %
5/16	5	3.5	1 5/8	108	80
3/8	11.5	8.5	1 7/8	108	80
7/16	16	12	2 1/2	108	80
1/2	20	15	M10X1.0	12	9
9/16	24	18	M12X1.5	16	12
5/8	24	18	M14X1.5	20	15
11/16	34	25	M16X1.5	24	18
7/8	54	40	M18X1.5	34	25
1 1/16	75	55	M22X1.5	54	40
1 3/16	88	65	M27X2.0	75	55
1 1/4	88	65	M33X2.0	88	65
1 5/16	108	80	M42X2.0	108	80
1 3/8	108	80	M48X2.0	108	80

Table 9. Tubing Nuts

Torque Values for Tubing Nuts	
Nominal Tubing Size	**Recommended Torque N•m (Lb_f•ft**
8 mm	39 (29)
10 mm	52 (38)
12 mm	62 (46)
15 mm	103 (76)
21.7 mm	118 (87)

Table 10. Banjo Fittings & Sealing Plugs with Copper Washers

Torque Values for Banjo Fittings & Sealing Plugs with Copper Washers	
Thread Size	**Recommended Torque N•m (Lb_f•ft**
M14 x 1.5	64 (47)
M16 x 1.5	83 (61)
M24 x 1.5	186 (137)

Clutch Plate Wear Limits

Clutch steel plates:

Minimum thickness: 2.10 mm (0.083 in.)

Clutch friction plates:

Minimum thickness: 3.15 mm (0.124 in.)

Operation

General

The control valve obtains primary, neutral and secondary positions. When these positions are selected, the control valve directs high-pressure oil through internal passages to operate the clutches. The pressure-rate control piston within the control valve assembly provides a rapid, smooth, oil pressure increase in the hydraulic system during clutch engagement.

Hydraulic System with Electric Control Valve

The oil pump draws oil through the strainer from the oil sump and discharges it through the oil filter. Filtered oil enters the control valve through the inlet port. The incoming oil forces the pressure regulator piston against the springs to open the path to the lubrication circuit. Oil not used for clutch engagement flows past the regulator piston to become lubrication oil. Lubrication oil flows through the heat exchanger to the lubrication oil circuit in the transmission to lubricate and cool the clutches and bearings. There is a lubrication oil pressure relief valve to limit maximum lubrication oil pressure to approximately 690 kPa (100 psi).

In Neutral, the inlet port of both clutches is connected to the atmosphere. Since the area behind the clutch pistons is open to sump, the clutches are disengaged. Oil is distributed through the lubrication system. The area between the pressure regulating piston and the rate-of-rise piston is connected to sump at all times to prevent any leakage oil from affecting the pressure regulation.

The pressure in the rate-of-rise chamber is controlled by a ball that is spring loaded against the orifice plate. The passage behind the ball and spring is connected to the sump (atmosphere) in Neutral and to main pressure when either clutch is engaged. A shuttle ball, connected to both clutch pressure ports, permits pressurizing this passage with oil from the engaged clutch without allowing oil to flow to the disengaged clutch.

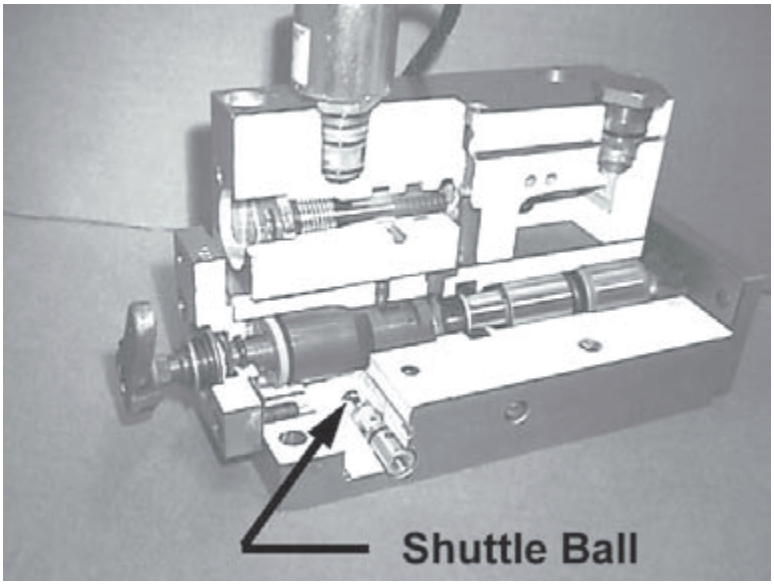


Figure 3. Location of Shuttle Ball

The electric control valve can be used in a manual override mode in the event of an electrical power failure.

When the control valve is energized or shifted to engage either clutch, the valve directs main pressure to engage the selected clutch pack. Oil is also directed to move the rate-of-rise piston, compressing the pressure regulator springs. This progressively increases the clutch engaging pressure causing the clutches to engage at a controlled rate.

The control valve allows only one clutch to be engaged at a time, and the oil from the disengaged clutch is vented to sump (atmospheric pressure). The clutch return springs move the disengaged clutch's piston to the disengaged position minimizing clutch plate drag.

Control Valve Assembly in Neutral

Some of the main pressure oil from the oil inlet chamber flows through a passage to the orifice in the orifice plate. The small flow of oil through this orifice fills and begins to pressurize the rate-of-rise chamber.

Both clutches are connected to sump when the control valve is in Neutral. Since there is no pressure acting on the shuttle ball from either clutch, the passage behind the ball and spring regulator is also connected to sump. This allows the oil pressure in the rate-of-rise chamber to be regulated by the ball and spring, since the overage oil can flow to sump. The oil pressure in the rate-of-rise chamber acting on the rate-of-rise piston causes it to stroke over partially, which compresses the pressure regulating springs additionally.

This additional spring compression further resists the movement of the pressure regulating piston, resulting in a force balance between the area at the pressure regulator, the springs, and the area behind the rate-of-rise piston. Neutral main pressure of approximately 40 psi is maintained by relieving excess oil behind the rate-of rise piston through the ball and spring regulator.

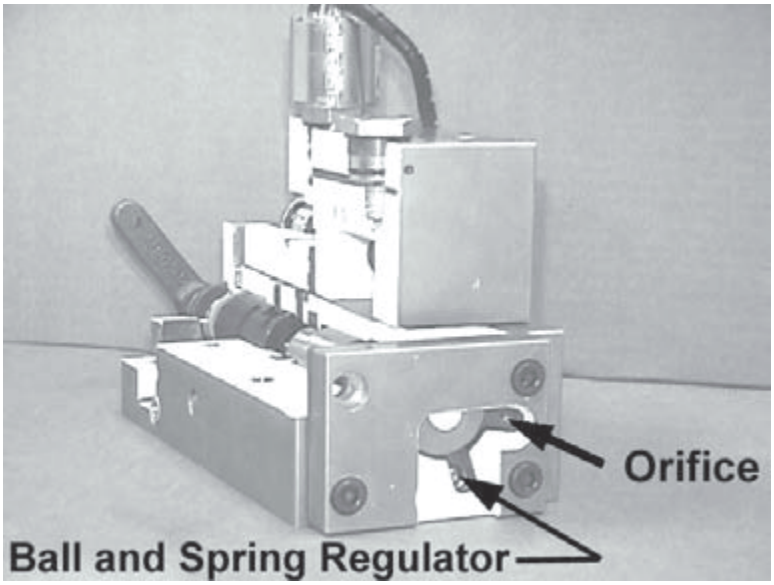


Figure 4. Neutral Regulator and Rate of Rise Orifice

Control Valve Assembly in Primary or Secondary

Pressurized oil is directed to one of the transmission's clutches to engage it. The pressurized oil in the clutch port of the engaged clutch acts on the shuttle ball, sealing off the passage to the opposite clutch. The pressurized oil also forces the ball of the ball and spring regulator against its seat on the orifice plate, stopping the flow of oil from the rate-of-rise chamber to sump. Since oil continues to flow into the rate-of-rise chamber through the orifice, the oil pressure in the rate-of-rise chamber increases. This increased oil pressure forces the rate-of-rise piston to stroke over to its stop in the valve body, compressing the pressure regulating springs even further yet.

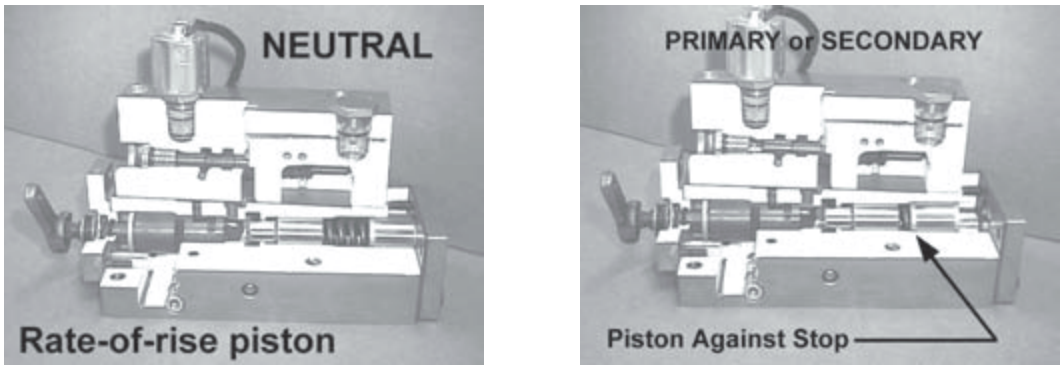


Figure 5. Rate of Rise Piston in Neutral (left) and Rate of Rise Piston with Clutch Engaged (right)

The travel rate of the rate-of-rise piston (and resulting pressure rate-of-rise) is controlled by the orifice size, regulator spring stiffness and the final main pressure after completion of the rate-of-rise cycle. Neutral main pressure controls the start time of the rate-of-rise cycle. When the rate-of-rise piston is against the stop (pressure regulating springs are compressed the most), the main oil pressure reaches approximately 356 psi.

When the control valve is shifted to Neutral, the clutch that was engaged is vented to sump within the valve. As a result, the passage behind the ball and spring regulator is vented to sump and induces a high differential pressure between the rate-of-rise chamber and the passage behind the ball and spring. Since the pressure in the rate-of-rise chamber is much greater than the pressure it is to be regulated at, the ball unseats from the orifice plate, allowing main oil pressure to return to the neutral pressure level rapidly and again be regulated by the ball and spring regulator. The ball returns to the pressure regulating position once the spring force is equal to force induced by the pressure at the rate-of-rise piston.

Electric Operation

The transmission normally operates with the control valve in the electric mode. Two spools, each controlled by a solenoid operated pilot valve, control clutch engagement. When a solenoid is energized, it opens the pilot valve and allows main pressure oil to flow to the end of the spool. The pressure acting on the end of the spool overcomes the return spring at the opposite end, causing the spool to stroke over and connect the clutch passage with main pressure passage.

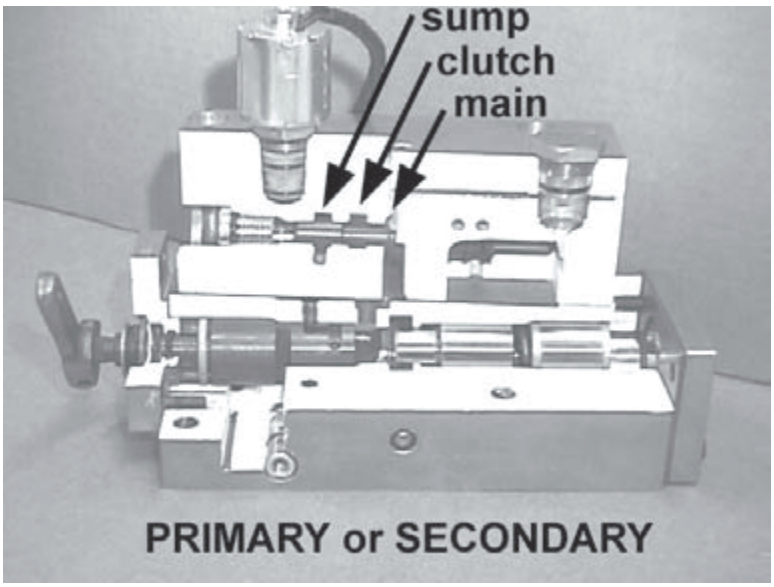


Figure 6. Pilot Spool Passages

Main pressure oil flows from the spools above to the clutch passages of the transmission below via connecting slots in the manual override stem. These connecting slots are aligned with passages in the valve body when the valve is in the electric mode.

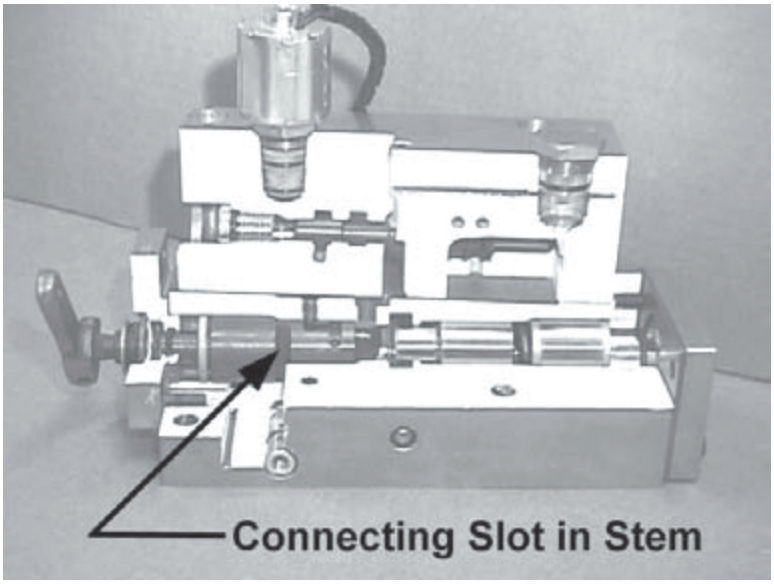


Figure 7. Flow Path in Override Spool

Main pressure from the energized solenoid operated pilot valve also acts on a pin on the return spring side of the opposite spool to ensure the opposite spool is connecting its clutch to sump. The clutch engagement cycle is outlined in the previous section.

Hydraulic Lock Feature (some models)

Some control valve models have a hydraulic lock feature, and are identifiable by a third solenoid operated pilot valve. This feature keeps the engaged clutch pressurized as long as the engine remains running, should electrical power fail or malfunction occur while the clutch is engaged. The hydraulic lock is accomplished by allowing pressurized oil (from the pressurized clutch passage) to flow inside the spool. Oil pressure inside the spool forces the dowel pin against the O-ring plug.

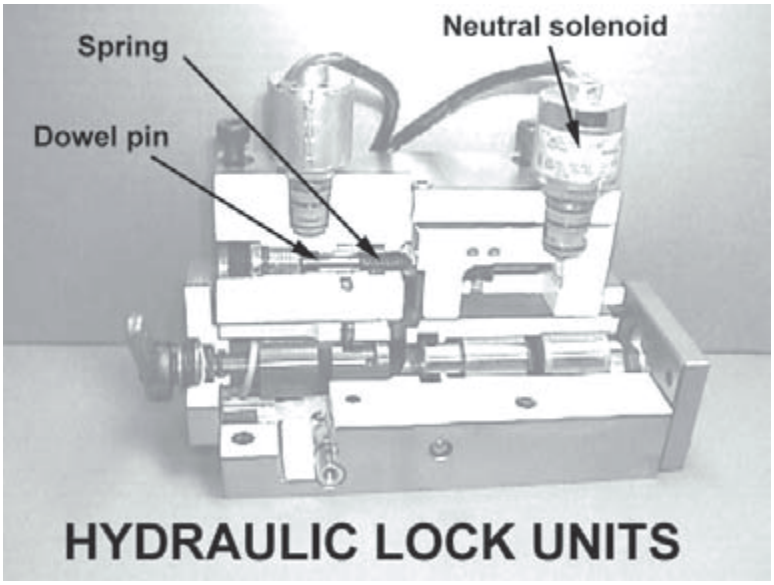


Figure 8. Hydraulic Lock Units

The resulting reaction is a force on the spool that overcomes the spool's return spring force. Should the solenoid become de-energized while the spool has its clutch pressurized, oil pressure will keep the spool in that position. This keeps the transmission in gear as long as the engine is running.

The hydraulic lock is disabled when either the engine is stopped, or the neutral solenoid is energized. When the neutral solenoid is energized, it sends pressurized oil to the dowel pins at the return spring end of each spool.
Since the dowel pin used at the return spring side of the spool is larger in diameter than the dowel pin inside the spool, the hydraulic force acting on the larger pin forces the spool to connect the clutch passage to sump with assistance from the return spring.

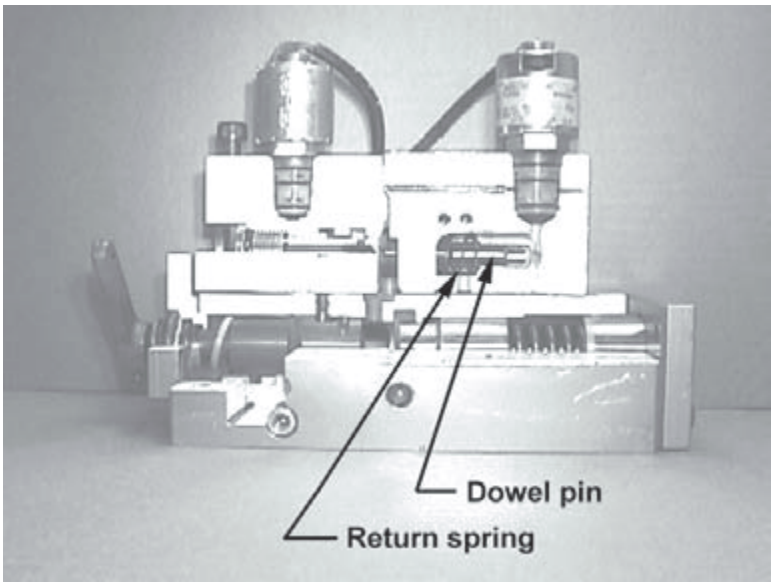


Figure 9. Neutral Solenoid Engaged

Manual Override Operation

The control valve has a manual override feature, which is a lever operated selector. When the manual override lever is rotated counterclockwise and pulled outwards, the upper portion of the valve is disabled because the connecting slots in the manual override stem are no longer aligned with the oil passages in the valve body. Oil pressure from the solenoid operated pilot valve controlled spools cannot reach the clutch pressure passages in the transmission. The main oil pressure regulator, shuttle ball, neutral pressure regulator, and rate-of-rise functions remain exactly the same as when the valve is in the electric mode. In the manual override position, shifting is controlled by rotating the lever on the manual override stem.

In the Neutral position, both clutches are vented to sump by two pockets in the stem.

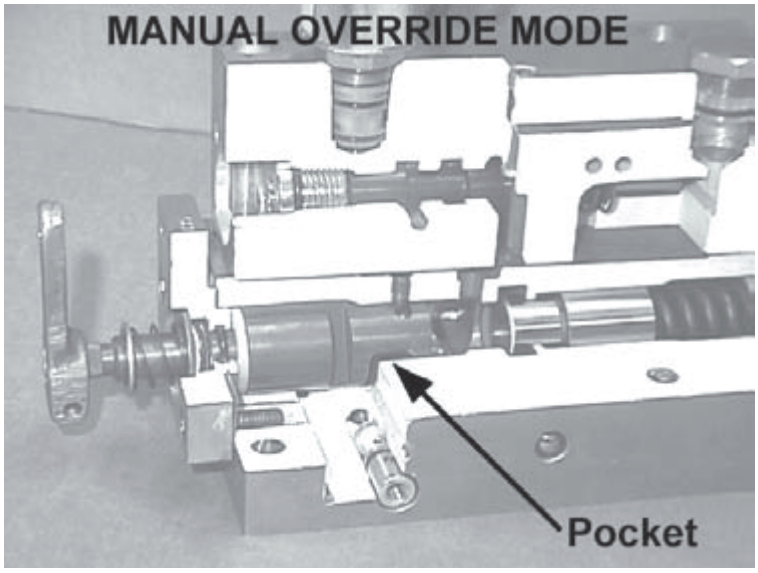


Figure 10. Stem Pocket or Passage

Main pressure oil can flow through the hole in the end of the stem to a narrow slot between the two pockets. This slot does not connect to any other passages when the stem is in the Neutral position.

When the lever and stem are rotated to engage either the primary or secondary clutch, main pressure oil flows through the slot in the stem to the appropriate clutch pressure port. The opposite clutch port passage remains connected to sump by the same pocket in the stem as when the stem was in the Neutral position. When the stem is rotated back to the Neutral position, the main pressure oil slot in the stem is no longer aligned with either clutch port. Both clutches are again vented to sump by the two pockets in the stem.

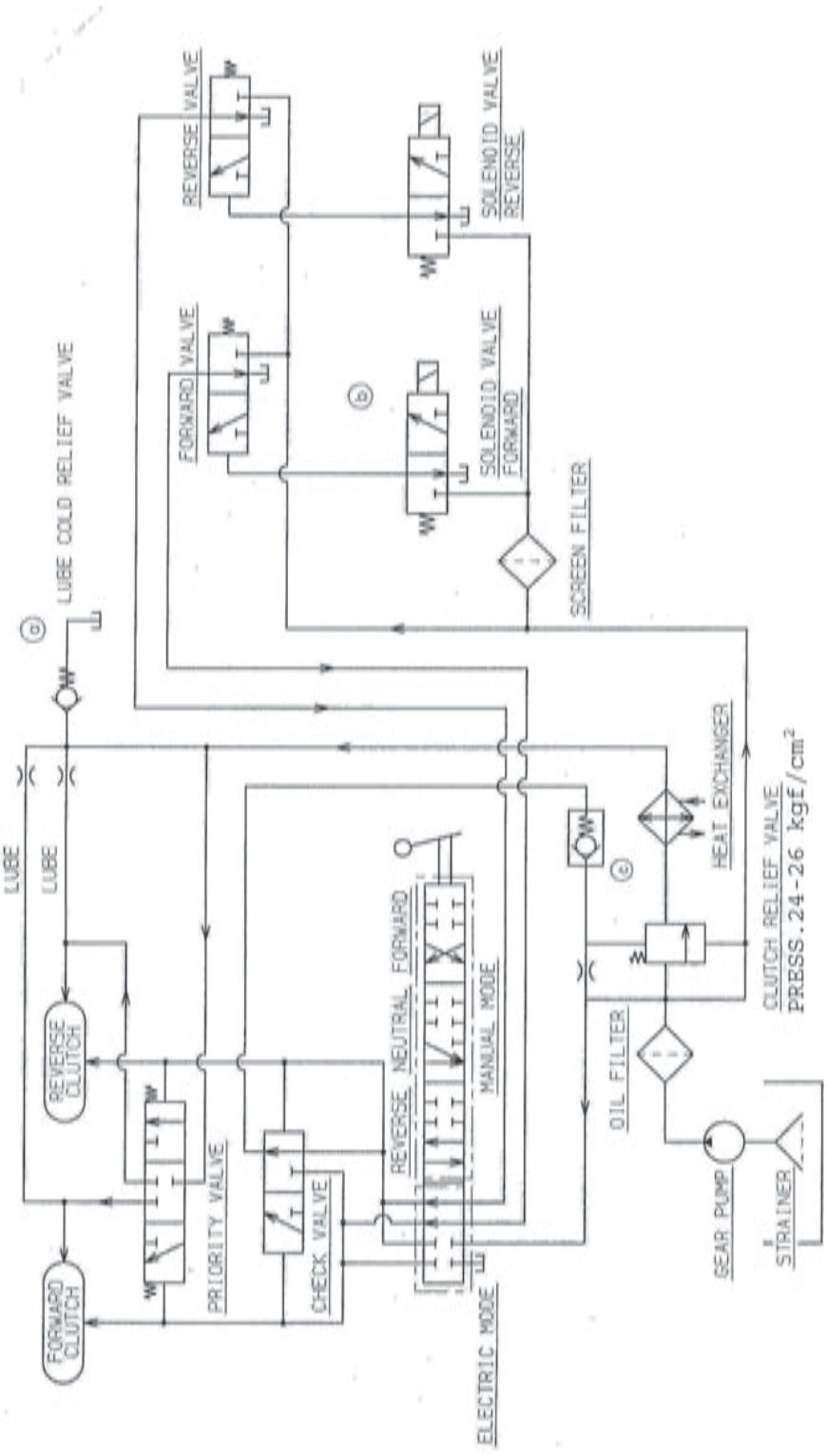


Figure 11. Hydraulic Schematic (electric control valve)

Trolling Valve (Optional)

The trolling valve is used to reduce and control propeller speed below that normally attained by operating the engine at low idle. Actuating the trolling function reduces clutch apply pressure to reduce the propeller speed.

The trolling valve for this transmission does not control the pressure in the rate-of-rise chamber when in the trolling mode, it controls the flow of oil to the engaged clutch. Trolling is achieved by restricting the flow of main pressure oil to the engaged clutch, which ultimately controls the pressure in the engaged clutch of the transmission. The trolling feature is available when the selector valve is in the electric mode, but is disabled when the selector valve is in the manual override mode.

Main pressure oil can flow into the trolling valve through a fixed orifice at all times. Oil may exit the trolling valve through a variable orifice. The size of the variable orifice depends on the trolling valve lever position.

When the trolling valve lever is in the detented position, the variable orifice is closed. Since oil can flow into the trolling valve through the inlet orifice and is not allowed to escape, the oil pressure inside the trolling valve rises to match main oil pressure. This oil pressure inside the trolling valve pushes the piston assembly over to compress the large diameter spring behind it. The compressed spring pushes the flow control piston against its return spring, allowing unrestricted flow of oil to the engaged clutch. Unrestricted flow of oil to the engaged clutch results in full clutch apply pressure.

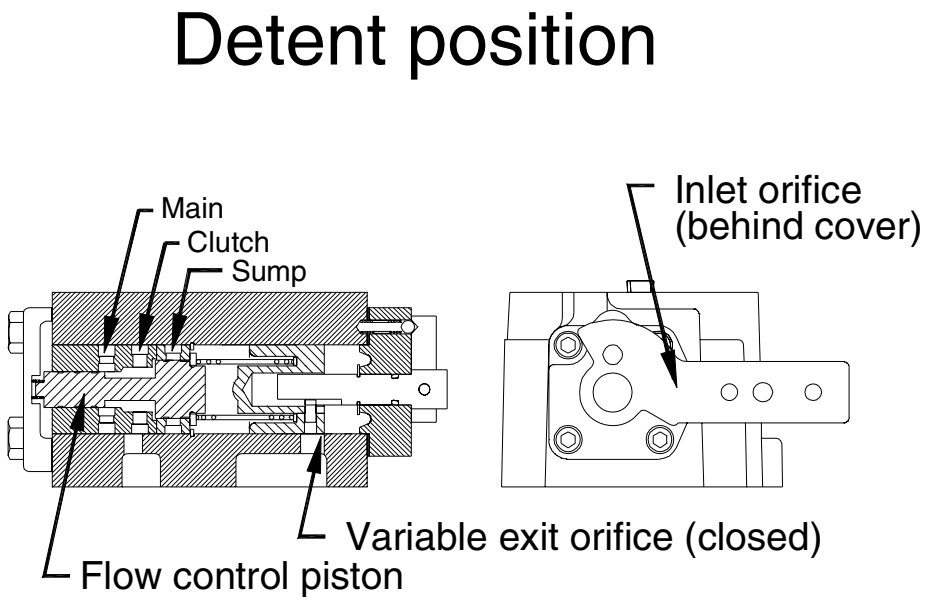


Figure 12. Trolling Valve in Non-trolling Position

Rotation of the trolling valve lever into the trolling mode opens the variable orifice, allowing some of the oil in the trolling valve to flow to sump. This reduction in oil pressure within the trolling valve allows the piston assembly to move towards the lever end of the valve, reducing the amount of compression in the spring behind it. Since the spring is no longer fully compressed, the flow control piston moves in its bore, and restricts the flow of main pressure oil to the engaged clutch. This causes the clutch apply pressure to be reduced, allowing the clutch plates in the transmission to slip. The amount of pressure reduction and resulting clutch slip is ultimately controlled by the trolling valve lever position.

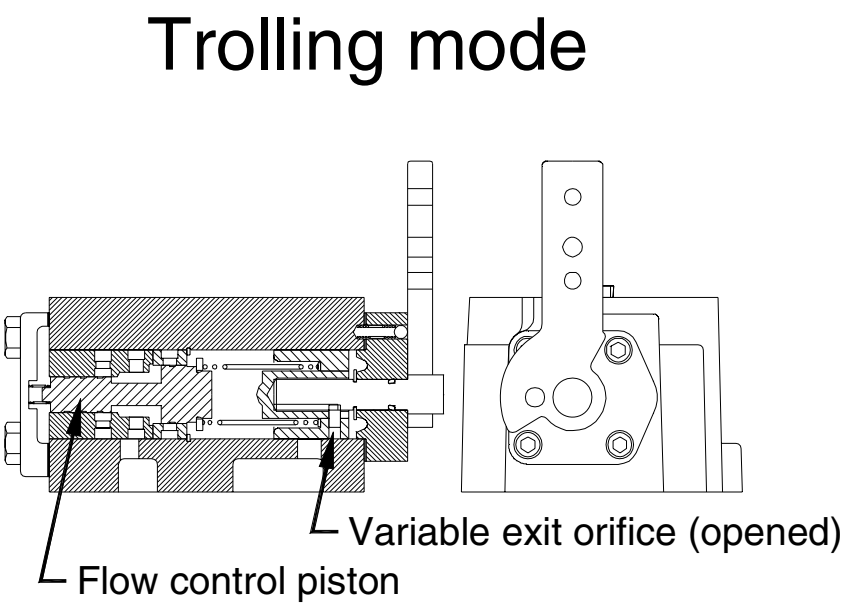


Figure 13. Trolling Valve in Trolling Position

Power Take-off (Optional)

There are two types of power take-off available for this marine transmission. Both are designed to drive hydraulic pumps meeting SAE-J-744 with flange size 127, and shaft size 32-4.

Live Pump Mount Power Take-off

The live pump mount power take-off drives accessories using engine horsepower. Since the live power take-off connects the accessory to the primary shaft of the transmission via a direct coupling, the accessory is driven when the engine is running.

Hydraulic Clutched Pump Mount Power Take-off

The hydraulic clutched power take-off also allows accessories to be driven using engine horsepower. Since the power take-off is attached to the primary shaft of the transmission, the accessories can be driven any time the engine is running. The power take-off is engaged by the power take-off electric control valve that can be engaged manually if necessary.

The hydraulic clutched power take-off operates with oil pressure supplied by the transmission's hydraulic system.

Trailing Pump (Optional)

The trailing pump is used to supply oil flow to the transmission lubrication circuit when the transmission is in a backdriving condition. Backdriving occurs when the engine is shut down and the transmission output shaft is being driven by water flow across the propeller.

The trailing pump is driven by the output shaft, and oil flow from the trailing pump flows through a check valve into the transmission's lubrication circuit below the heat exchanger.

Power Flow

Input power to the transmission is through a torsional coupling mounted on the engine flywheel. The coupling is splined to the forward end of the primary (forward clutch) shaft causing the primary shaft to rotate in engine direction during engine operation. Power is transmitted to the secondary shaft by means of the transfer gear teeth on the outer diameter of the primary clutch housing. These teeth are in constant mesh with gear teeth on the of the secondary clutch housing causing the secondary shaft to rotate in anti-engine direction. The primary and secondary pinions on their respective shafts are in constant mesh with the output gear, which is connected to the output shaft through a keyless tapered joint.

Application of the primary clutch locks the primary pinion to the primary shaft causing the pinion to turn in the shaft direction and causing the output shaft to rotate in anti-engine direction. Application of the secondary clutch locks the secondary pinion to the secondary shaft causing the pinion to turn in the shaft direction and causing the output shaft to rotate in engine direction.

Neutral

When in Neutral the primary and secondary shafts, transfer gears and clutch friction plates rotate at engine speed.

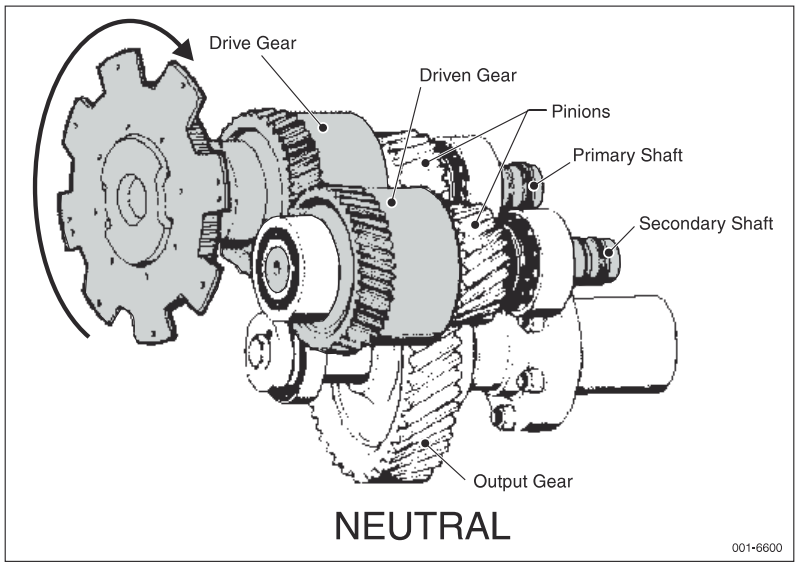


Figure 14. MG-6619SC Power Flow in Neutral

Primary

When the primary position is selected, hydraulic pressure is applied to the primary clutch piston clamping the friction and steel clutch plates together. The primary input pinion will then rotate at engine speed and direction because the steel plates are spline-connected through the clutch hub assembly to the pinion. Because the primary input pinion is in mesh with the output gear, the output gear and shaft will rotate in anti-engine direction. The secondary input pinion will be backdriven (engine direction) when the unit is in the primary position.

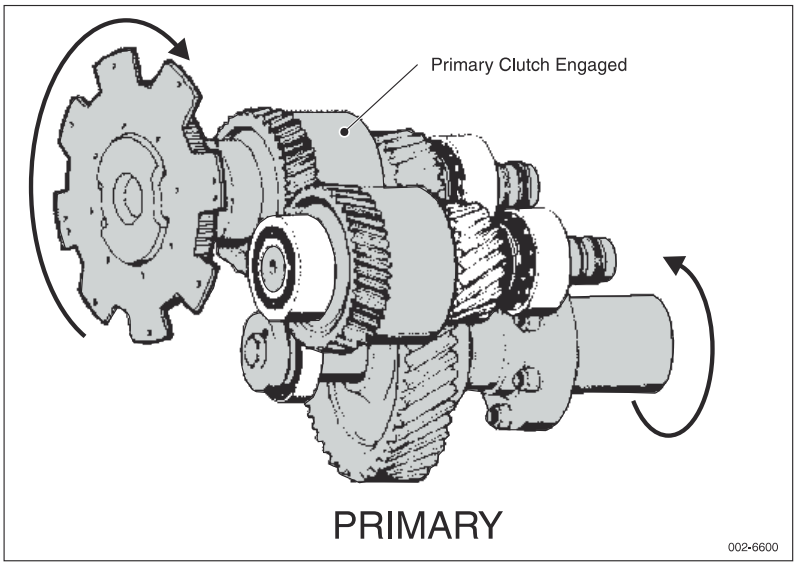


Figure 15. MG-6619SC Power Flow with Primary Clutch Engaged

Secondary

In secondary, the same parts are turning that were turning in neutral. When the secondary position is selected, hydraulic pressure is applied to the secondary clutch piston clamping the friction and steel plates together. The secondary input pinion will then rotate at engine speed and anti-engine direction, because the steel clutch plates are spline connected through the clutch hub assembly to the input pinion. Because the secondary input pinion is in mesh with the output gear, the output gear and shaft will rotate in engine direction. The primary input pinion will be backdriven (anti-engine direction) when the unit is in the secondary position.

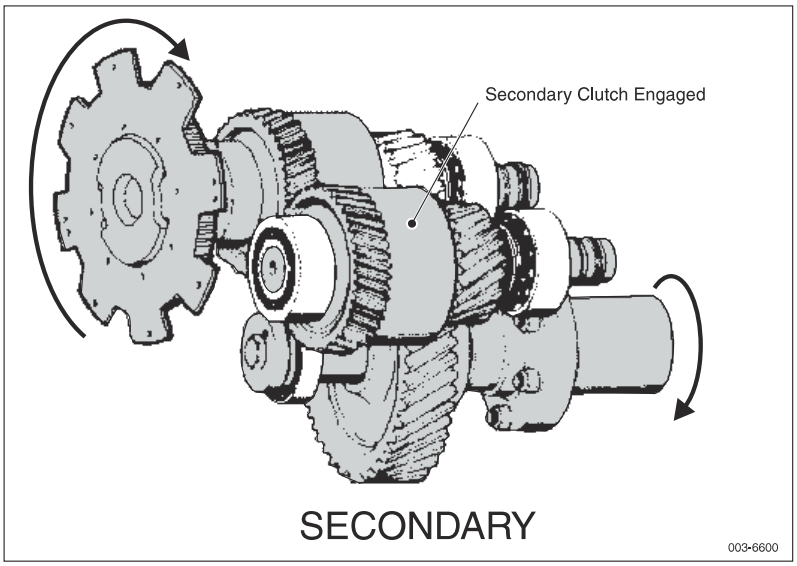


Figure 16. MG-6619SC Power Flow with Secondary Clutch Engaged

NOTES

Preventative Maintenance

Lubrication

Grease the oil seals on the output end of the output shaft through the grease fitting with water pump (lithium soap-based NLGI No. 2) grease. Apply grease every 100 hours or when the boat is docked.

No other lubrication is required beyond the daily oil check.

Oil System

Oil Level

The oil level should be checked daily or every 10 hours. Check oil level before starting the engine to confirm that the transmission has oil in it. With the engine running at low idle and the transmission in Neutral, check the oil again. The oil level should be near the "low" oil level mark. Transmission oil temperature should be in the normal operating range prior to finalizing the oil level between the low and full marks on the oil level gauge.

Oil and Filter Change Interval

With a new transmission, change the oil and filter element within the first 50 hours of operation. Change oil and filter element after each 1000 hours thereafter or more often if conditions warrant.

For a rebuilt transmission, check the filter element after eight hours of operation. If the filter is clean, install a new filter element and then change the oil and filter element after 1000 hours of service. If the filter is dirty, change the element and operate for another eight hours. Check the filter again. Continue this cycle until the filter is clean and then change the oil and filter after 1000 hours of service or more often depending on conditions.

Draining

Drain the transmission by removing the 3/8 PT square head plug with magnet at the rear side at the bottom.

Oil Suction Strainer

Remove and clean the pump suction strainer at every oil change or sooner if necessary. The suction strainer is located at the lower end of the pump. See Engineering Drawings for suction strainer location.

Type Oil Recommended

See Description and Specifications.

Filling

1. Remove the filler breather in the top cover of the transmission.

2. Fill the transmission's sump with 22 liters (5.8 U.S. gal.) of the proper weight and type oil. See Description and Specifications for oil recommendations.

3. Start the engine and let it idle with transmission in neutral until oil is circulated throughout the hydraulic system. Add oil if necessary to bring the oil level up to the "low" mark with the engine at low idle.

4. With the oil at operating temperature, transmission in Neutral, and the engine running at low idle, check the oil level with the oil gauge. Add or remove oil if necessary to bring the oil level to "FULL" mark on the oil gauge.

5. Allow the oil temperature to cool to normal cold oil conditions (perhaps overnight). Check the oil level while cold at low idle engine speed while in Neutral. Make note of the oil level in the cold conditions for future reference, as it corresponds to the correct oil level at operating temperature.

Torsional Coupling

Do not obstruct the flywheel housing vents preventing the free flow of air for cooling the coupling. The ambient temperature of the air around the coupling should be between -6˚C (22˚F) and 80˚C (176˚F). Assure baffles are installed properly so hot air is ported out of the housing.

Visually inspect the element after the first 100 hours of operation and every 2000 hours thereafter, or every six months, whichever comes first. Torsional vibration, misalignment, degradation by contaminants (oil), heat, ultraviolet radiation, and excessive system torque can cause cracks or other signs of distress to appear on the surface of the rubber. These situations affect the life of the coupling element.

When inspecting the flexible coupling, look for evidence or conditions identified in the following steps:

- ❑ Cracks in the surface of the rubber. May be caused by torsional vibrations, excessive misalignment or exposure to contaminants (heat, petroleum products, chemicals, ozone, ultraviolet radiation, etc.) excessive system torques.
- ❑ Separation of rubber from flex plate on coupling plate or deterioration of the rubber-to-metal bond. See above.
- ❑ Deterioration of the rubber element, as evidenced by sponginess or by black carbon-like dust on rubber surface. May be caused by contaminants or excessive heat, either external or internal to the coupling.
- ❑ Cracked, bent or otherwise damaged flex plate or coupling plate.
- ❑ Bolt holes in flex plate or coupling plate elongated oval shaped, not round. This could be caused by improperly assembled parts, loose parts, vibration or improperly torqued parts.
- ❑ Bolts/nuts—bent, worn or stripped threads.

Inspect the hub, looking for the following:

- ❑ Damaged or worn splines.
- ❑ Cracked parts.
- ❑ Oil seal surface for wear or damage.

Replace any defective parts including defective fasteners that are found.

Heat Exchanger Check

Heat exchangers furnished by Twin Disc to be used for salt water applications have zinc rods installed at the inlet and outlet heads. These rods must be checked every 90 days. If over 50% of the rod is disintegrated, it should be replaced to provide effective protection.

Excessive corrosion of the zinc rod indicates electrolytic action. A careful inspection should be made to determine if this action is caused by a short circuit or external grounded electric current. If these conditions do not exist, it is evident that the corrosion is due to local electrolysis. If rods are corroded with foreign materials, they should be cleaned with a wire brush.

In-boat Repair

Certain transmission maintenance/repair procedures can be accomplished in the boat provided sufficient space exists to work. These procedures are:

- ❑ Removing and installing the oil pump.
- ❑ Changing the filter.
- ❑ Removing, cleaning and installing the suction strainer.
- ❑ Removing and installing the control valve.
- ❑ Removing and installing the manifold or top cover, and bearing carrier.

Overhaul Interval

A complete overhaul of the unit should be made at the same time that the engine is overhauled.

Periodic Visual Inspection

- ❑ Check the mountings for tightness or damage such as cracks. Tighten loose mountings and replace damaged parts.
- ❑ Check pressure and temperature gauge where applicable.
- ❑ Inspect the oil lines and heat exchanger for leaky connections, cracks, or other damage. Replace damaged lines.
- ❑ Periodically, inspect the drive line and the input and output shaft oil seals for leakage. Replace parts as required.

Troubleshooting

Troubleshooting Chart

The following chart is intended as a guide for determining the cause of problems that could be encountered and the corrective actions for those difficulties.

The transmission is one part of a complete power package. Problems in the input power system or the output power delivery components can cause problems to develop in the transmission. It is therefore important that the entire power package be considered when problems are encountered.

Tables begin on the next page.

Table 11. Troubleshooting Chart

Symptom	Cause		Remedy	
1. Low main oil pressure	1-1	Partially clogged oil strainer	1-1	Remove and clean oil strainer.
	1-2	Stuck pressure regulation piston.	1-2	Disassemble the valve and clean the piston.
	1-3	Broken piston rings on clutch shaft(s).	1-3	Remove the collector and inspect piston rings.
	1-4	Damaged or worn oil pump assembly.	1-4	Replace damaged or worn oil pump assembly (pump is not serviceable)
	1-5	Incorrect linkage adjustment to control valve assembly.	1-5	Adjust linkage so that control valve stem is indexed properly by detent.
	1-6	Clogged or plugged orifice in orifice plate of control valve assembly.	1-6	Remove orifice plate cover. Clean parts.
	1-7	Shimming required between regulator springs and rate-of-rise piston.	1-7	Shim as required.
	1-8	Engine idle speed too low.	1-8	Raise engine speed.
2. No oil pressure, or erratic low pressure at control valve tap.	2-1	Oil pump suction strainer plugged.	2-1	Remove and clean strainer.
	2-2	Oil level low.	2-2	Check oil level and correct.
	2-3	Air leak on suction side of pump.	2-3	Correct cause of air leak.
	2-4	Pump drive on reverse clutch shaft broken.	2-4	Disassemble and repair as required.
	2-5	Regulating valve stuck in open position	2-6	Remove, disassemble, clean and repair the regulating valve.
	2-6	Oil pump defective	2-7	Replace oil pump.
	2-7	Leaking heat exchanger has caused oil to be lost over board.	2-7	Replace heat exchanger

Table 11. Troubleshooting Chart (continued)

Symptom	Cause		Remedy	
3. High main oil pressure.	3-1	Regulating valve stuck.	3-1	Remove and clean regulating valve.
	3-2	Improperly shimmed.	3-2	Shim as required.
	3-3	Lube relief valve malfunction.	3-3	Inspect, repair or replace parts as necessary.
4. High temperature.	4-1	Improper oil level.	4-1	Check and fill (or drain) with proper oil to the correct level.
	4-2	Faulty heat exchanger	4-2	Inspect, repair, or replace heat exchanger.
	4-3	Clutches slipping	4-3	Check clutch apply oil pressure. If pressure is normal, remove, disassemble, and repair slipping clutch.
	4-4	Bearing failure.	4-4	Overhaul marine transmission.
	4-5	Air leak on suction side of pump.	4-5	Inspect and correct cause of suction leak.
	4-6	Control valve malfunction	4-6	Inspect, repair, or replace control valve.
5. Excessive Noise	5-1	Bearing failure.	5-1	Overhaul marine transmission.
	5-2	Worn or damaged input coupling.	5-2	Remove marine transmission. Replace a worn or damaged coupling.
	5-3	Excessive torsional vibration.	5-3	Select proper torsional coupling.
	5-4	Worn or damaged gears.	5-4	Overhaul marine transmission.
	5-5	Improper alignment.	5-5	Check alignment of engine and transmission output flange to propeller shaft. Correct as necessary.
	5-6	Damaged propeller.	5-6	Repair propeller.
	5-7	Misfiring engine.	5-7	Repair engine.

Table 11. Troubleshooting Chart (continued)

Symptom	Cause		Remedy	
6. No neutral.	6-1	Clutch plates warped.	6-1	Remove clutch plates. Overhaul unit.
	6-2	Control valve incorrectly indexed.	6-2	Check and adjust control linkage.
	6-3	Solenoid malfunction (units equipped with electric selector valve)	6-3	Replace defective solenoid.
	6-4	Hydraulic lock piston stuck (units equipped with electric selector valve and hydraulic lock).	6-4	Inspect, repair, or replace hydraulic lock spool.
7. Harsh engagement.	7-1	Regulating piston or rate-of-rise piston stuck.	7-1	Disassemble control valve. Clean parts. Replace parts if necessary.
	7-2	Orifice plate ball in control valve not seating properly.	7-2	Remove orifice plate cover. Clean parts. Replace parts if necessary.
	7-3	Blown gasket on either side of orifice plate.	7-3	Replace gasket.
8. Low lube oil pressure.	8-1	Pump flow output too low.	8-1	Replace pump.
	8-1	Pump suction strainer plugged.	8-2	Remove, clean, inspect, and install the suction screen.
	8-3	Air leak on suction side of pump.	8-3	Inspect and correct cause of suction leaks.
	8-4	Lube relief valve malfunction.	8-4	Remove and clean or replace parts as necessary.
	8-5	Broken piston rings.	8-5	Replace damaged piston rings.
9. Oil spilling out of breather.	9-1	Oil level too high.	9-1	Adjust oil level.
	9-2	Wrong type of oil.	9-2	Draw and refill with recommended oil.

Disassembly

The following procedure is for complete disassembly of the unit. Prior to this procedure, the transmission should be removed from the boat. Qualified personnel should do the work in a fully equipped facility.

Note: Photos are used for illustration purpose of the procedure and may not appear consistent with previous disassembly steps.

Prepare Transmission for Disassembly

Note: During the service of this unit, all O-rings, gaskets and seals must be replaced. It is good practice to keep the used components (O-rings, gaskets, and seals) with the appropriate components for reference during the inspection and assembly process (to make sure you don't forget the quantity, size, etc.).

⚠ CAUTION

Flat washers are used under all fasteners where the head of the fastener contacts an aluminum surface.

Pipe threads called out as PT on drawings and in this text are different from NPT threads. PT threads and NPT threads are NOT interchangeable. Adapters are available from several manufacturers to convert PT threads to NPT threads.

Most pusher screws used in the disassembly of this transmission are threaded through aluminum parts. ALWAYS LUBRICATE the threads of the pusher screw before threading it into the mating part. When installing pusher screws, avoid rapid tightening with an impact wrench or similar device. If an impact wrench is used with the pusher screws the threads may gall or seize in the aluminum part. Tighten pusher screws in an even manner to avoid damaging components.

Component Identification

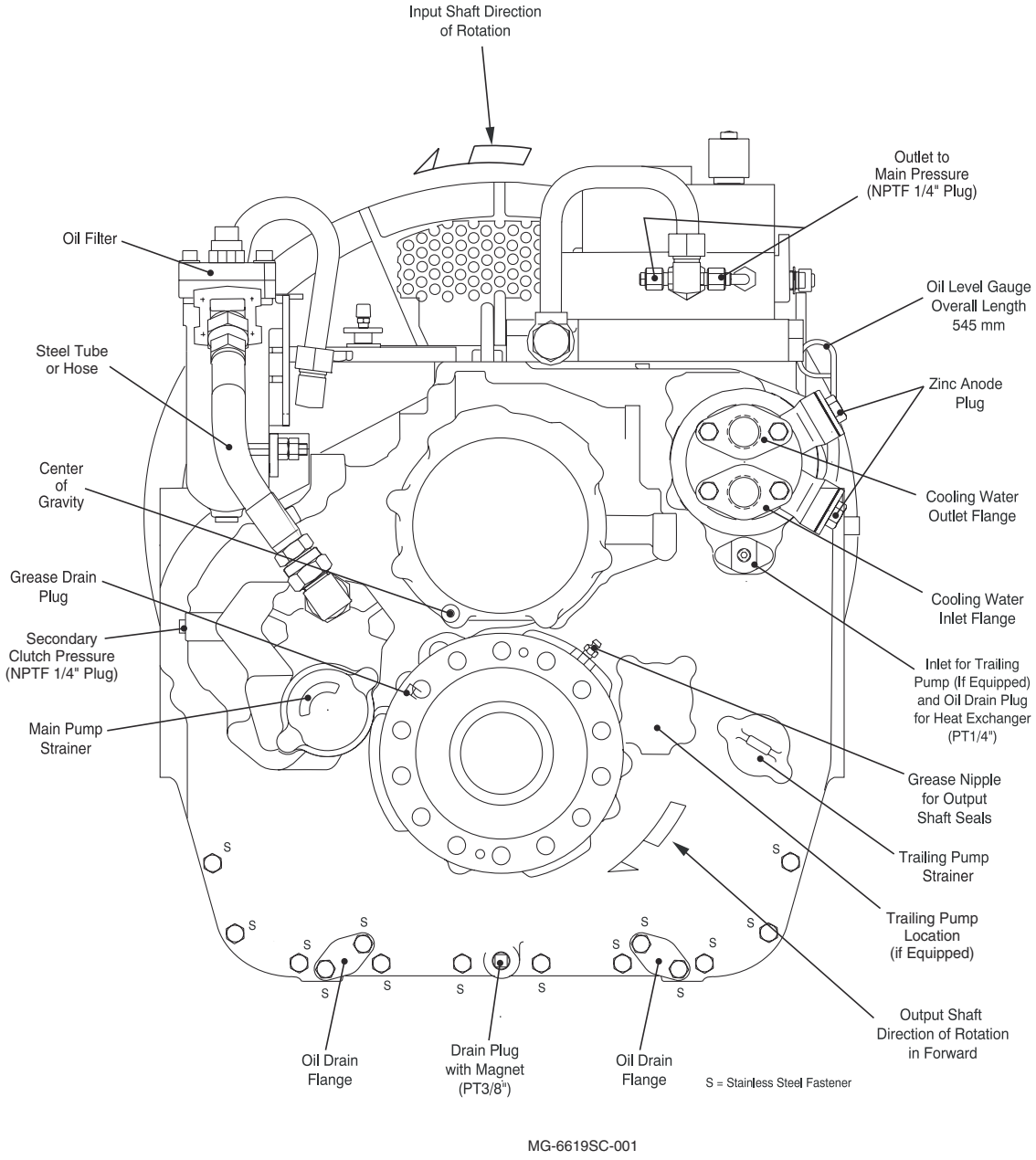

Input Shaft Direction of Rotation
Outlet to Main Pressure (NPTF 1/4" Plug)
Oil Filter
Oil Level Gauge Overall Length 545 mm
Steel Tube or Hose
Zinc Anode Plug
Center of Gravity
Cooling Water Outlet Flange
Grease Drain Plug
Cooling Water Inlet Flange
Secondary Clutch Pressure (NPTF 1/4" Plug)
Inlet for Trailing Pump (If Equipped) and Oil Drain Plug for Heat Exchanger (PT1/4")
Main Pump Strainer
Grease Nipple for Output Shaft Seals
Trailing Pump Strainer
Trailing Pump Location (if Equipped)
Output Shaft Direction of Rotation in Forward
Oil Drain Flange
Drain Plug with Magnet (PT3/8")
Oil Drain Flange
S = Stainless Steel Fastener
MG-6619SC-001

Figure 17. MG-6619SC Component Identification and Location

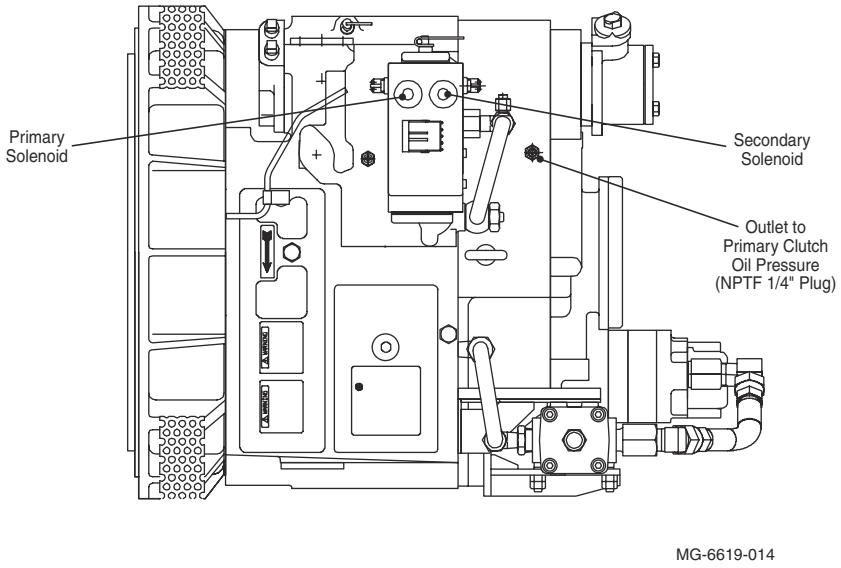


Figure 18. MG-6619SC Component Indentification and Location

Drain Oil

Transmission Sump

Drain the oil from the transmission sump by removing the square head 3/8" PT pipe plug from the bottom, rear side of the transmission bottom housing.

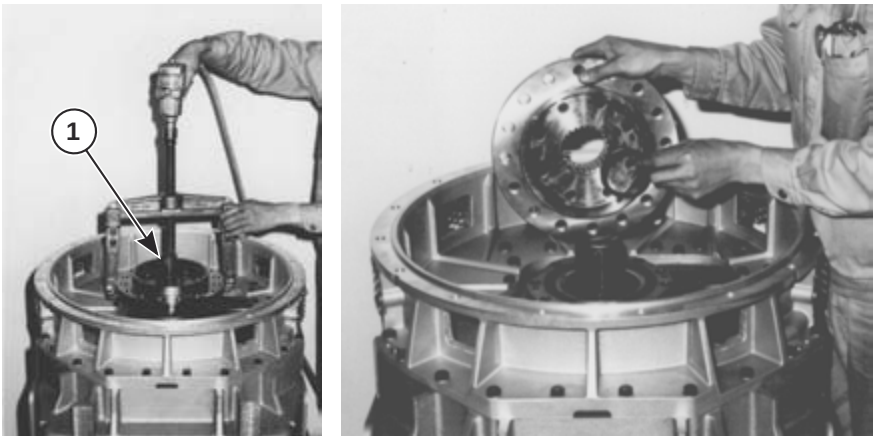
Heat Exchanger

Drain the oil from the heat exchanger by removing the pipe plug from the bottom of the heat exchanger rear cover.

Transmission External Components

Input Drive Hub

Remove the input drive hub (1) from the input drive sleeve.



2136-003 2136-005

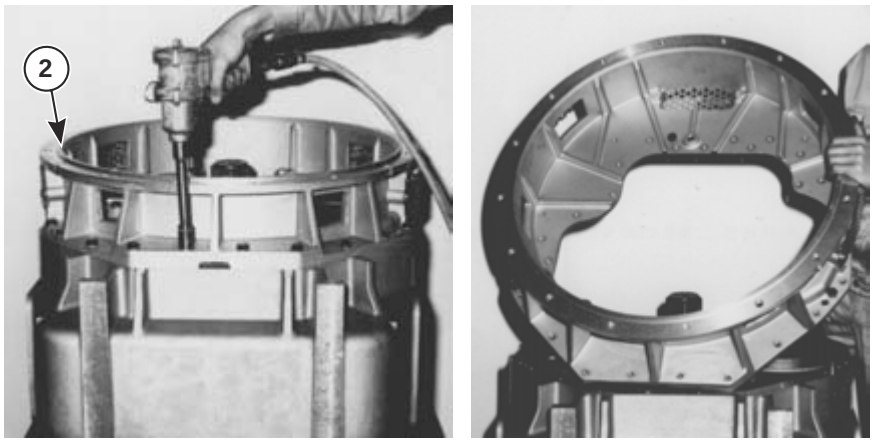
Figure 19. Input Drive Hub (1) Removal

Front Housing

1. Remove the front housing (2) from the transmission main housing. The front housing (constructed of aluminum) is equipped with two pusher screw locations near the housing dowel pin locations to assist in the removal of the housing. Thread two M10-1.5 x 60 mm fully threaded cap screws (lubricated) into the pusher screw locations to push the front housing away from the main transmission housing.

⚠ IMPORTANT

Always lubricate the pusher screw threads before use. Always tighten pusher screws evenly.



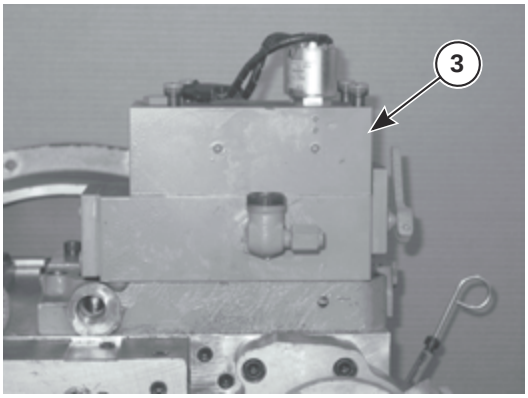
2136-006 2136-008

Figure 20. Transmission Front Housing (2) Removal

Selector Valve, Ditch Plate and Oil Filter

1. Disconnect oil supply tube from the filter housing and the selector valve (3).

2. Remove the selector valve.



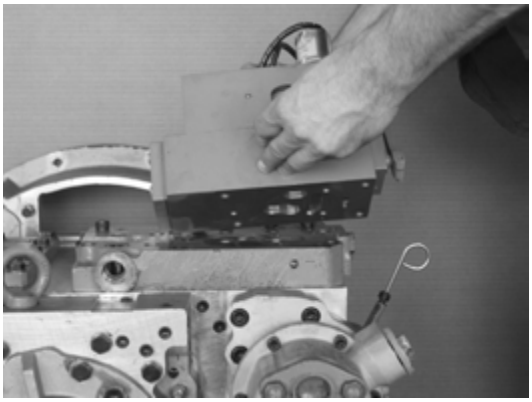


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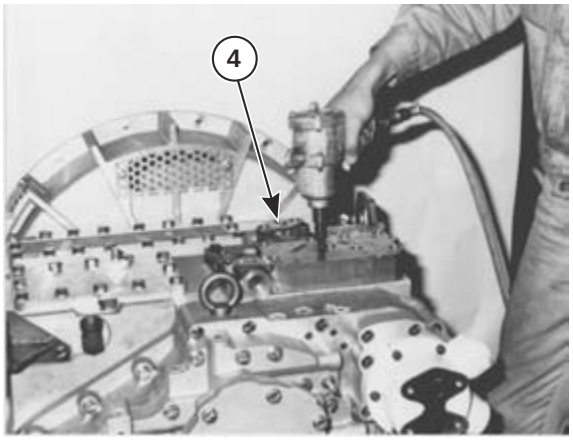
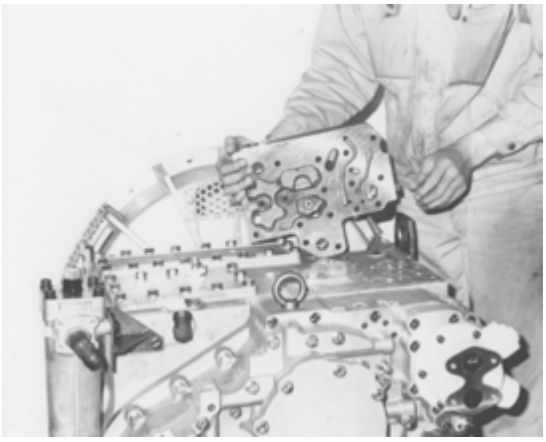
Figure 21. Selector Valve (3) Removal

3. Remove control valve ditch plate (4) and gasket.

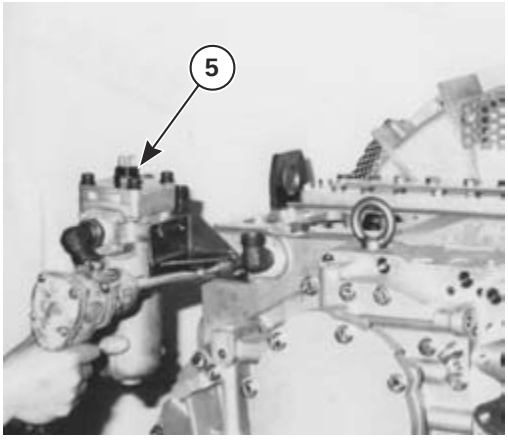




2053-007 2053-006

Figure 22. Ditch Plate (4) Removal

4. Remove the oil filter (5) and the oil filter bracket.

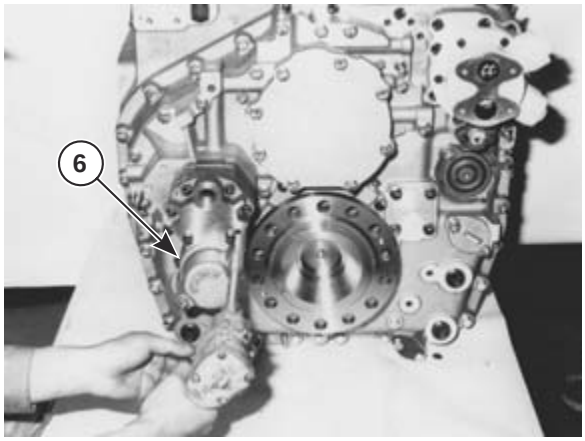


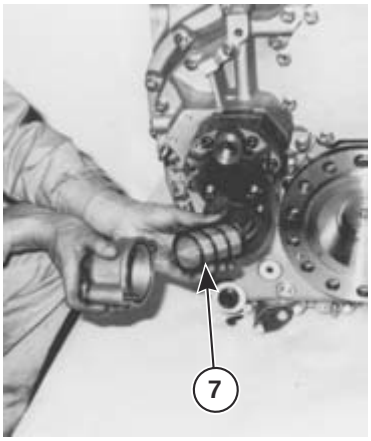
2053-002

Figure 23. Oil Filter (5) Removal

Suction Strainer and Screen

1. Remove the suction strainer cover (6) from below the pump and remove the suction strainer (7). The cover of the suction strainer is sealed with an O-ring. The suction strainer is located inside a spring to hold it into position.





2053-001 2052-035

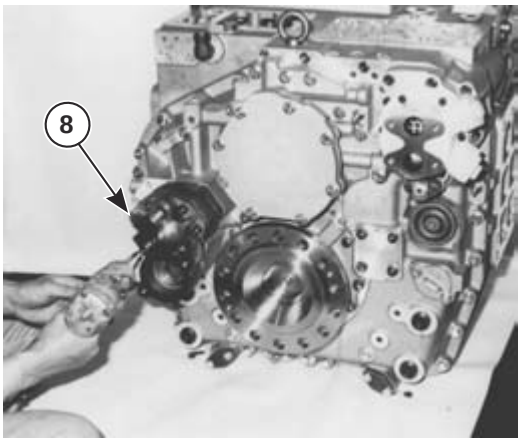
Figure 24. Suction Strainer Cover (6) and Suction Strainer Screen (7) Removal

Oil Pump

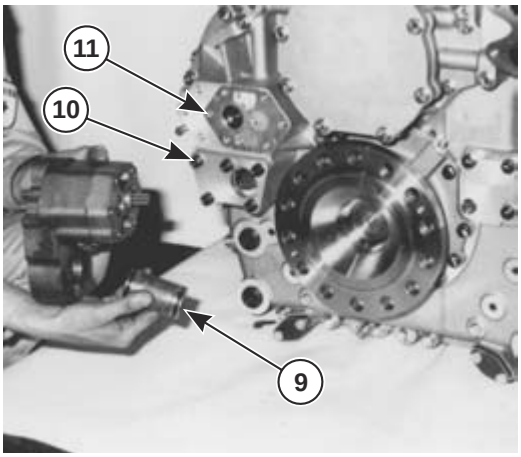
1. Remove the oil pump (8) and the jumper tube (9) located behind the pump. The jumper tube is sealed at each end with an O-ring and is fitted into a pump adapter plate (10) on the rear side of the transmission.

2. The oil pump is sealed to the pump mounting gasket (11). Note the orientation of the gasket to assist in the re-assembly process.

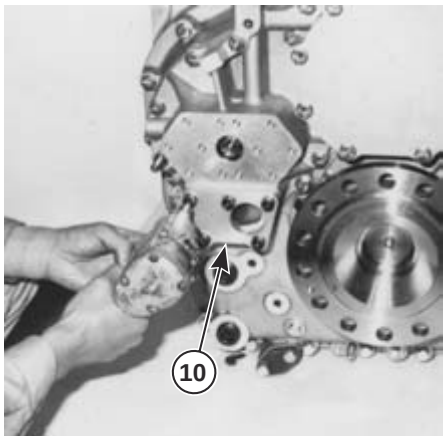
3. Remove the pump adapter plate (10). Note the orientation of the pump adapter plate to assist in the re-assembly process.



2052-034



2052-033

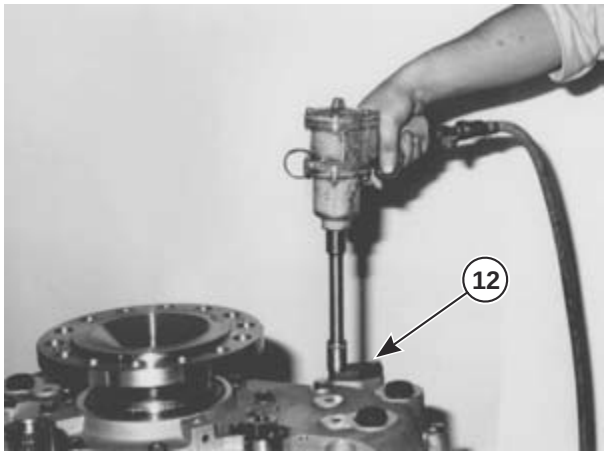


2052-031

Figure 25. Oil Pump (8) Removal

Oil Drain Flange

1. Remove the oil drain flange (12) on the rear side of the transmission.



19-4-018

Figure 26. Oil Drain Flange (12) Removal

Heat Exchanger

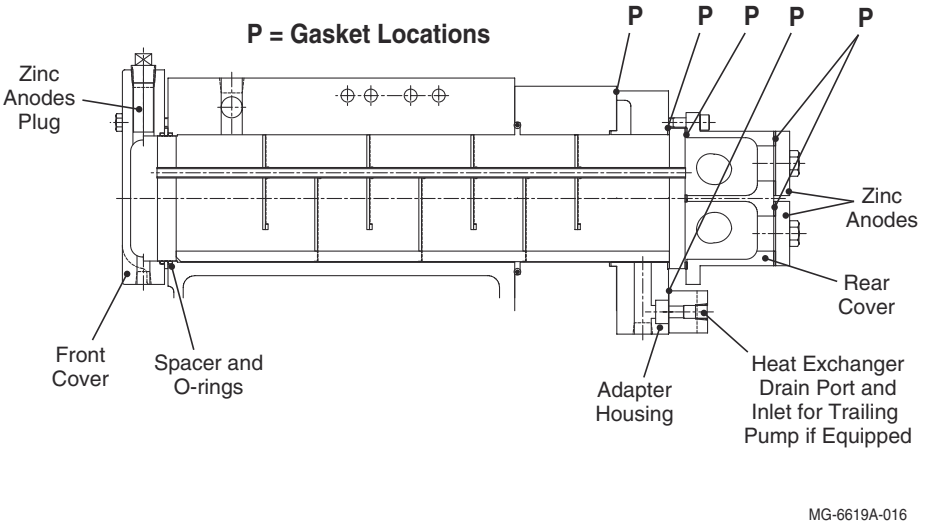


Figure 27. Heat Exchanger Component Identification and Location

1. Remove the heat exchanger oil drain plug (1) from the rear housing.

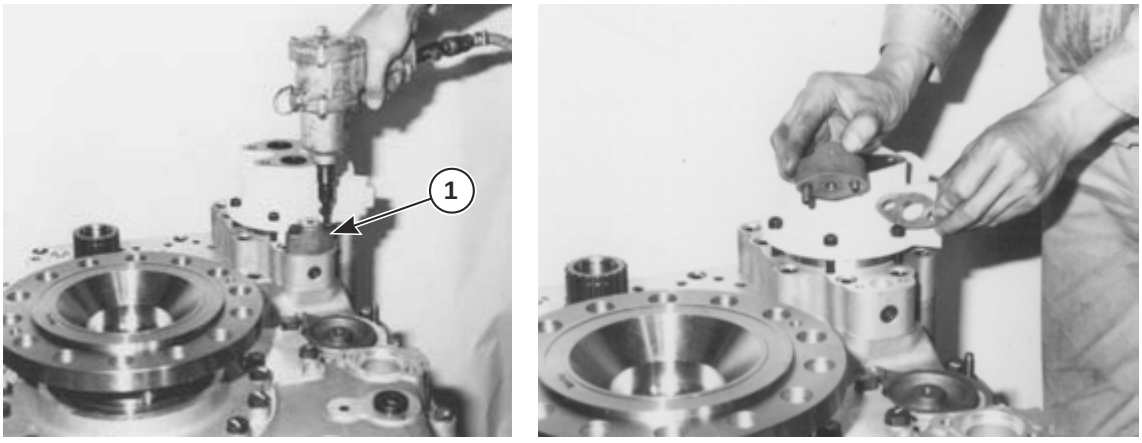
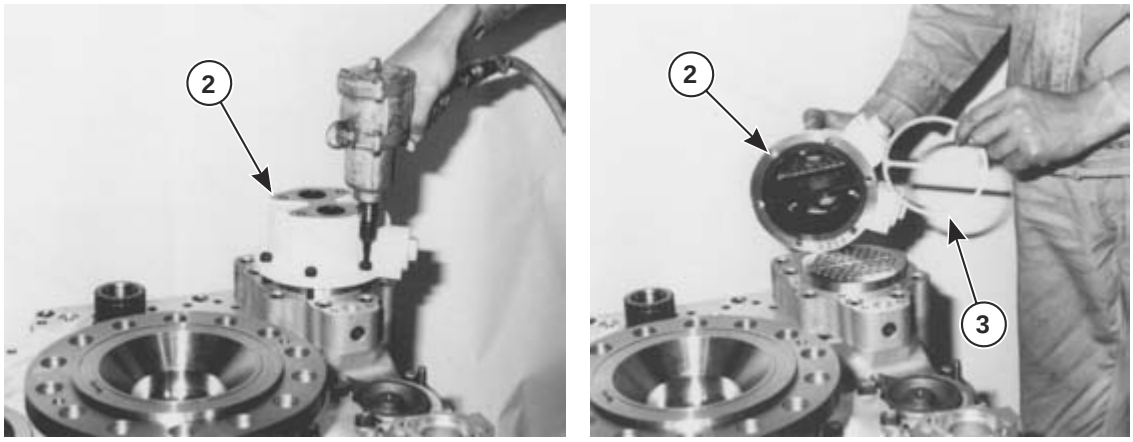


Figure 28. Heat Exchanger Oil Drain Plug (1) Removal

2. Remove the rear cover (2) and gasket (3) from the heat exchanger.

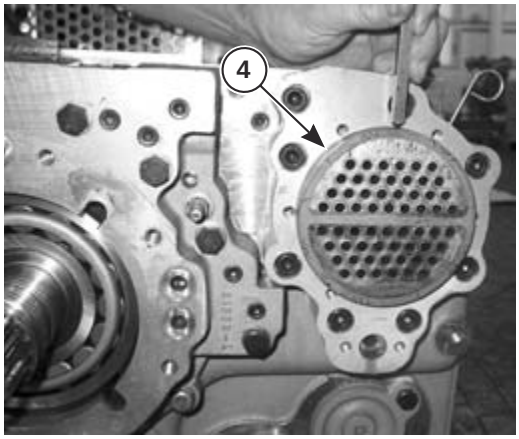


2052-015 2052-014

Figure 29. Heat Exchanger Rear Cover (2) and Gasket (3) Removal

Note: The rear heat exchanger cover (2) is equipped with a gasket (with divider) (3) that separates the inlet of the heat exchanger from the outlet of the heat exchanger.

3. Mark the heat exhanger core (4) at the top to ensure it will be replaced into the transmission housing correctly.

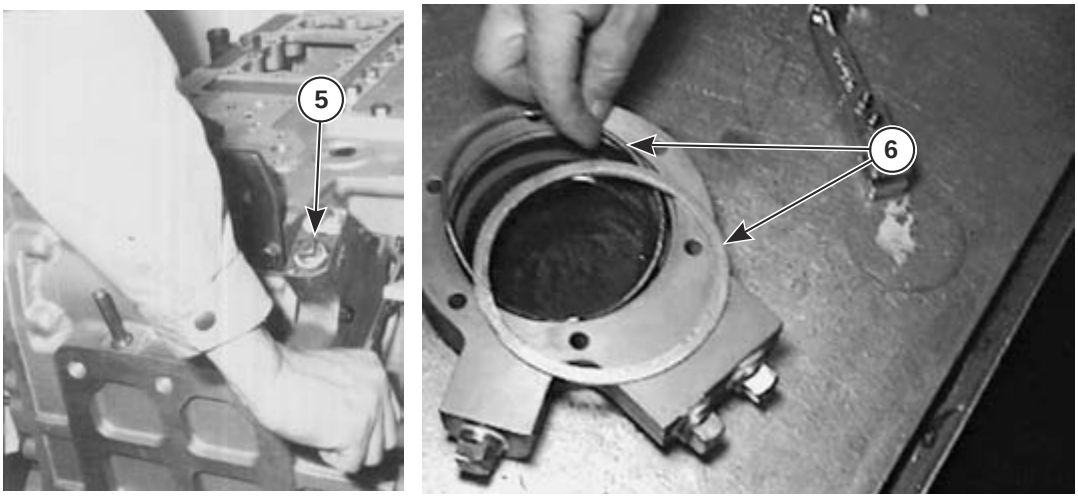


AR6557-18BE

Figure 30. Heat Exchanger Core (4) Indexing

4. Remove the front cover (5), spacer and two O-rings (6) from the heat exchanger.

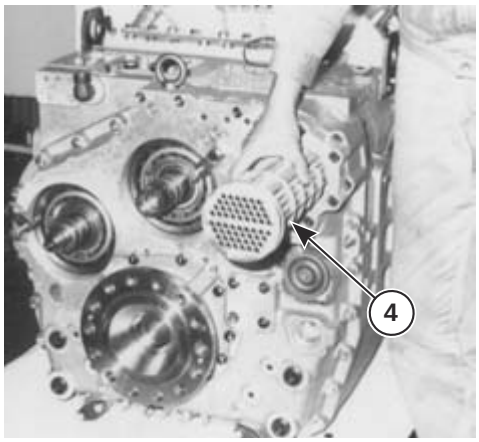
Note: The front cover of the heat exchanger uses a spacer (6) to locate the heat exchanger correctly in the transmission housing. The spacer is sealed on each side with an O-ring.



MG-6619-100 AR037-6557

Figure 31. Heat Exchanger Front Cover (5) Removal

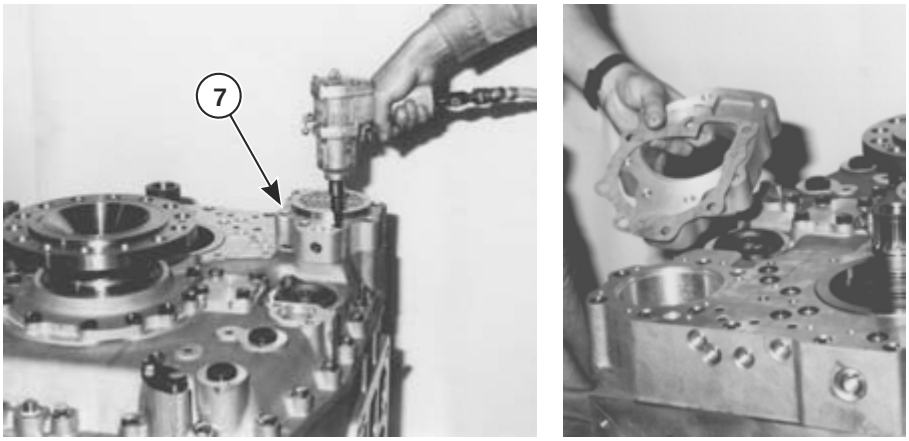
5. Remove the heat exchanger core (4) and gasket.



2052-006

Figure 32. Heat Exchanger Core (4) and Oil Baffle (9) Removal

6. Remove the heat exchanger adapter housing (7) and sealing gasket.



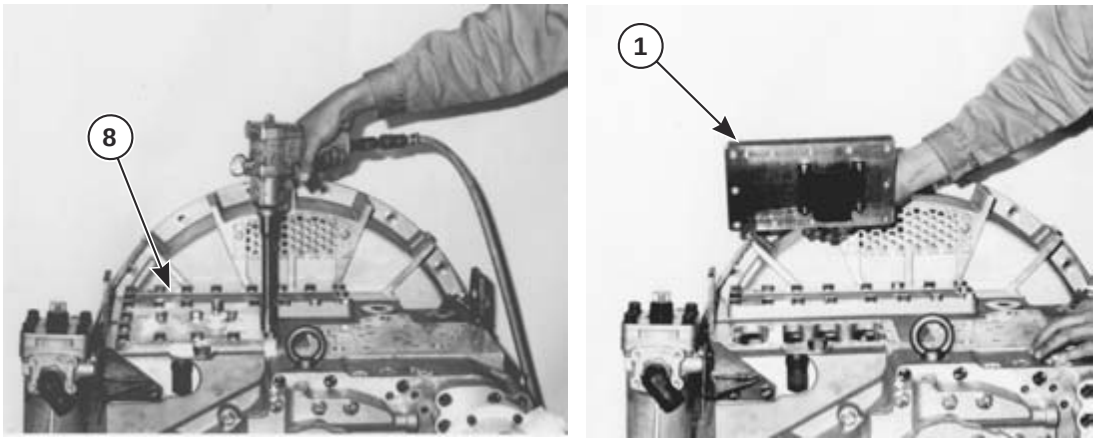
2052-013 2052-002

Figure 33. Heat Exchanger Adapter Housing (7) Removal

Top Cover and Access Cover

1. Remove the transmission top cover (8). The top cover contains the filter cap/breather.

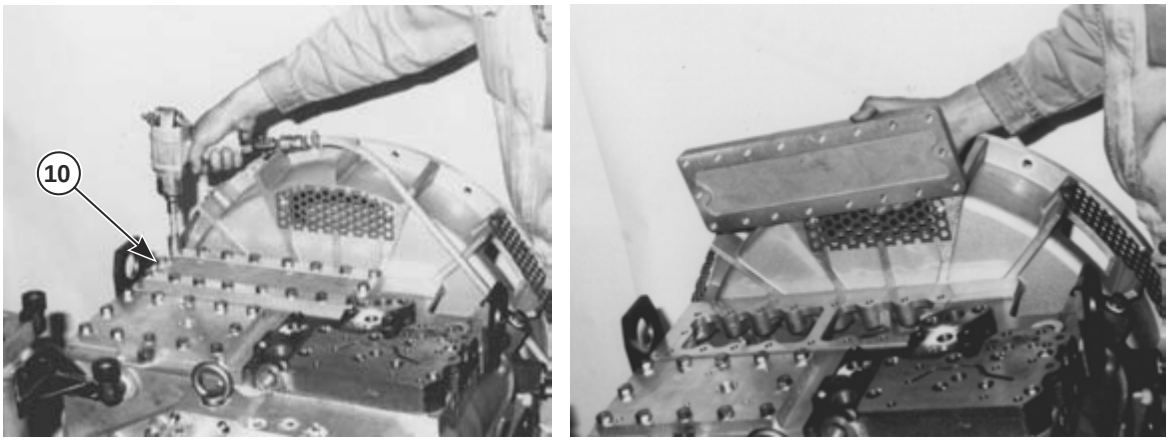
   Note: On the bottom surface of the top cover is an oil baffle (9) to prevent oil leakage through the breather. Do not remove the baffle from the top cover unless baffle replacement is necessary.



2053-004 2053-003

Figure 34. Top Cover (8) and Oil Baffle Removal

2. Remove the output gear access cover (10).



2053-020 2053-021

Figure 35. Output Gear Access Cover (10) Removal

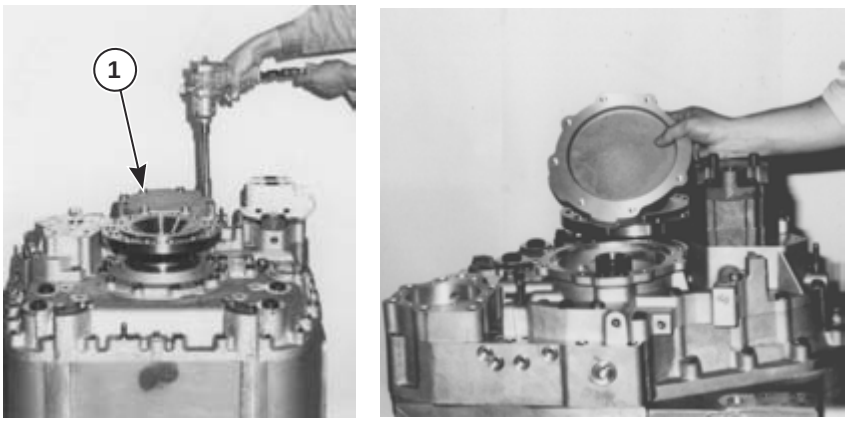
Primary and Secondary Clutch Shaft Assemblies

PTO Cover

1. Place the transmission on blocks with the output flange at the top. Be sure transmission is supported securely.

2. Remove the PTO cover (1).

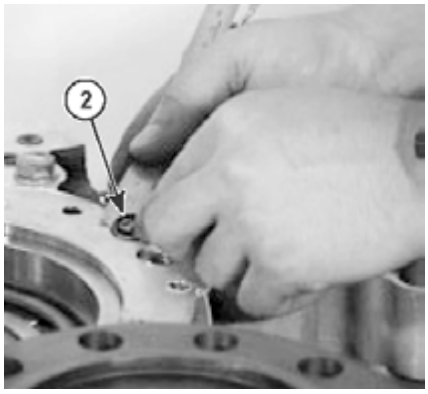
   a. Gently tap the PTO cover to break the sealer bond from the transmission housing.
   b. Remove the PTO cover.



2052-027 2012-018

Figure 36. PTO (1) Removal

3. Remove the two O-rings (2) located in the manifold counterbores.

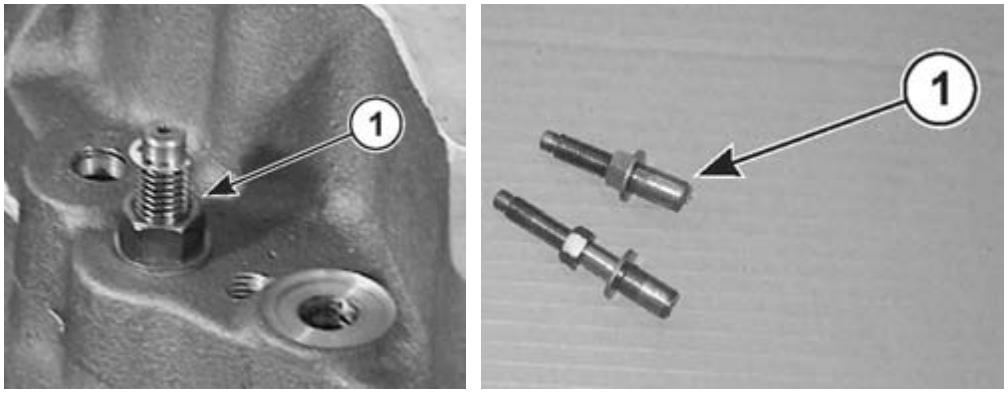


RO58-6557

Figure 37. Manifold O-ring (2) Removal

Oil Manifold

1. Remove the oil manifold screws.



AR069-6557 AR6557026BE

Figure 38. Dowel Pins (1)

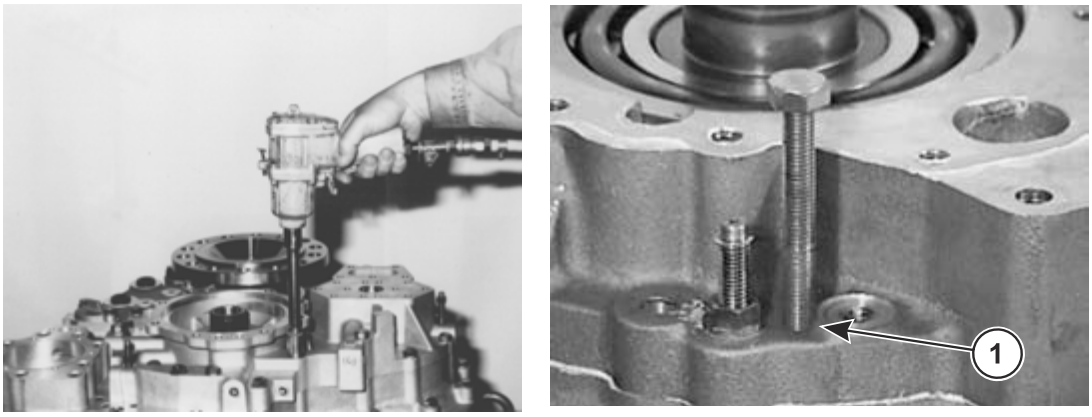
2. Tighten the nut on the dowel pin (1) to pull the dowel out of the transmission housing. Tighten the nuts until they bottom on the end of the threads. Pulling the dowel pin from the the transmission housing will assist in removal of the manifold.

3. The oil manifold is equipped with two pusher screw (2) locations near the dowel pins to assist in the removal of the oil manifold.

4. Thread two M10-1.5 X 60 mm fully threaded cap screws (lubricated) into the pusher screw locations to push the oil manifold away from the transmission housing.

⚠ IMPORTANT

Always lubricate the pusher screw (2) threads before use. Always tighten pusher screws evenly.

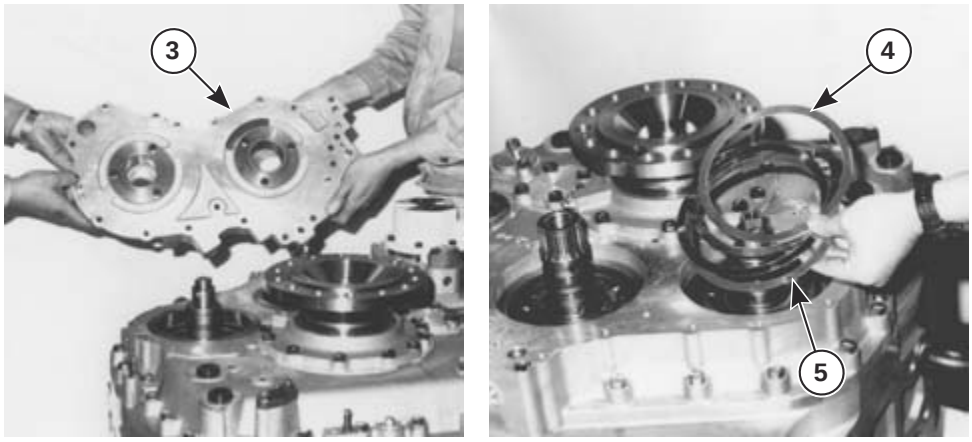


2012-008 AR072-6557

Figure 39. Manifold Pusher Screws (2) Removal

5. Remove the oil manifold (3) from the transmission housing.

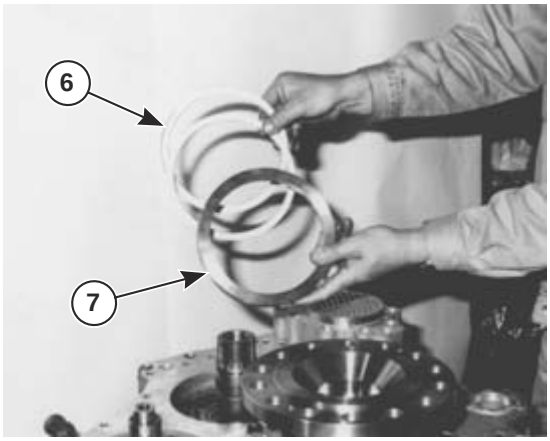
6. Remove the secondary shaft shims (4) and bearing spacer (5). Tag the components with identifying information.



2052-021 19-4-031

Figure 40. Oil Manifold (3) and Secondary Shaft Shims (4) and Bearing Spacers (5) Removal

7. Remove the primary shaft shims (6) and bearing spacer (7). Tag the components with identifying information.



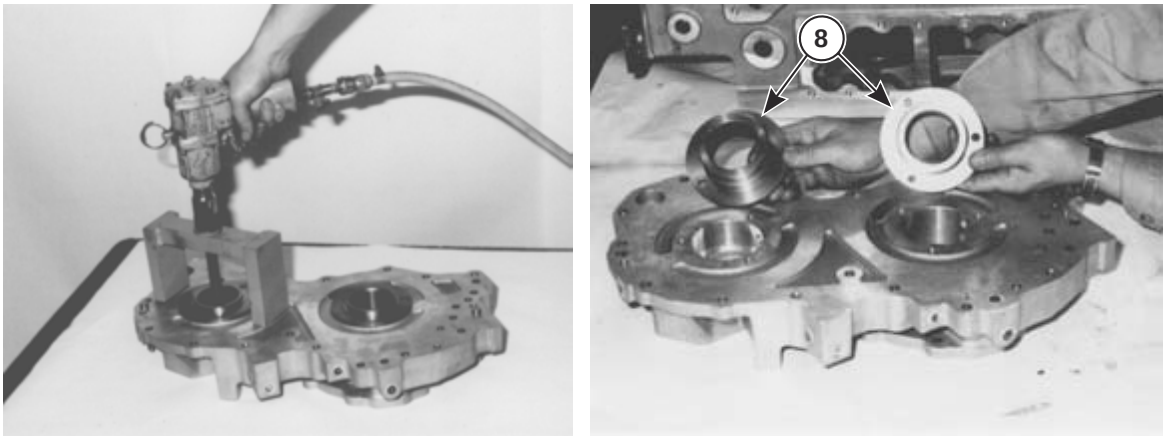
2052-011

Figure 41. Primary Shaft Shims (6) and Bearing Spacer (7) Removal

8. Remove the primary shaft and secondary shaft seal sleeves (8) from the manifold.

Note: Only remove sleeves if replacement is necessary. If removed, install new sleeves during assembly.

Note: The primary and secondary clutch shaft bearing cups are different from each other. Tag the components with identifying information. Use special tool T-21482-16 to remove seal ring sleeves.



2135-014 19-4-035

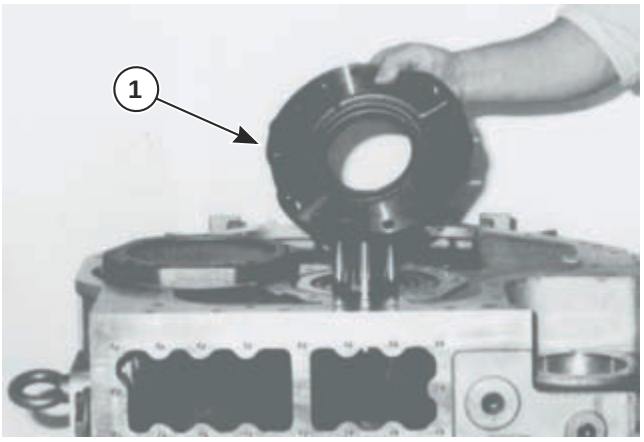
Figure 42. Primary Shaft and Secondary Shaft Sleeves (8) Removal

Primary and Secondary Clutch Shaft Covers

1. Install special tool T-21482-6 with spacers on primary and secondary shafts to prevent shafts from falling when transmission is rotated. Attach four support legs, T-21482-39 to the rear cover to support the transmission when it is turned over. It may be necessary to use spacers to level the housing.

2. Turn transmission over.

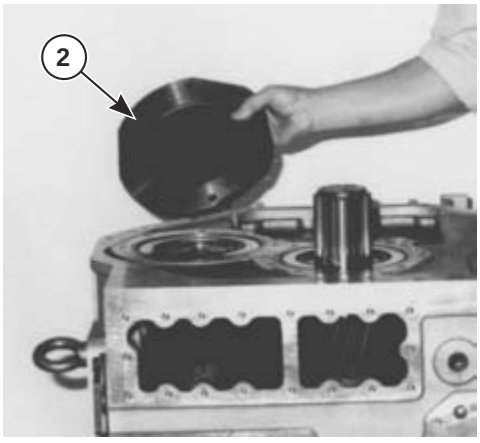
3. Remove primary clutch shaft front cover (1).



19-2-008

Figure 43. Primary Clutch Shaft Front Cover (1) Removal

4. Remove secondary clutch shaft front cover (2).



19-2-011

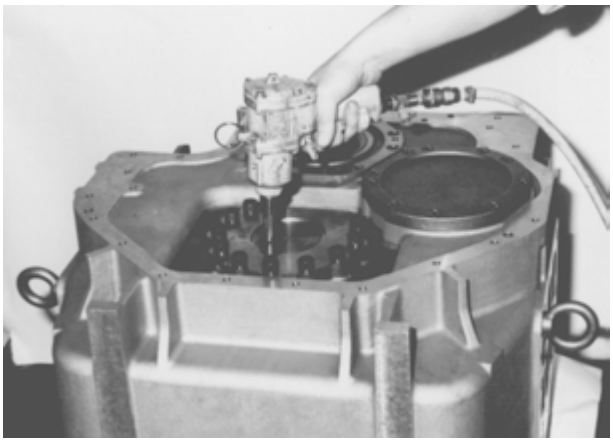
Figure 44. Secondary Clutch Shaft Front Cover (2) Removal

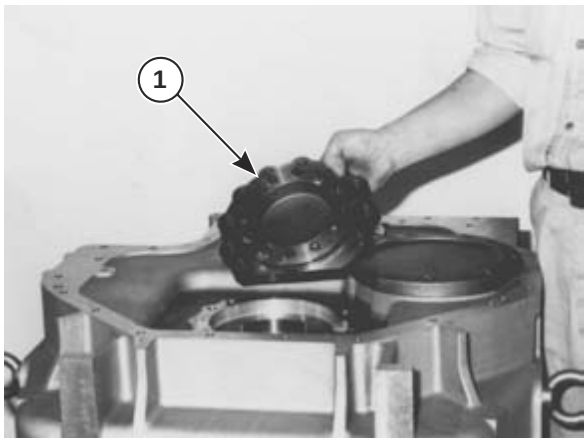
5. Remove primary and secondary clutch shaft bearing cup.

6. Install eyebolts to lift the main transmission housing from the clutch shafts and rear housing.

Output Shaft Front Bearing

1. Remove the output bearing cover (1) and screws with 12 coil springs.

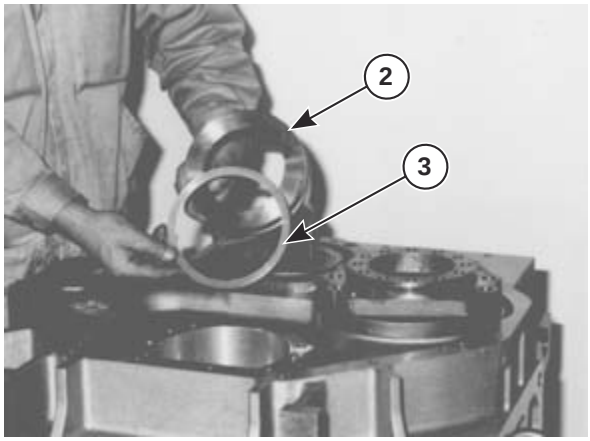




19-4-006 19-4-007

Figure 45. Output Shaft Bearing Retainer (1) Removal

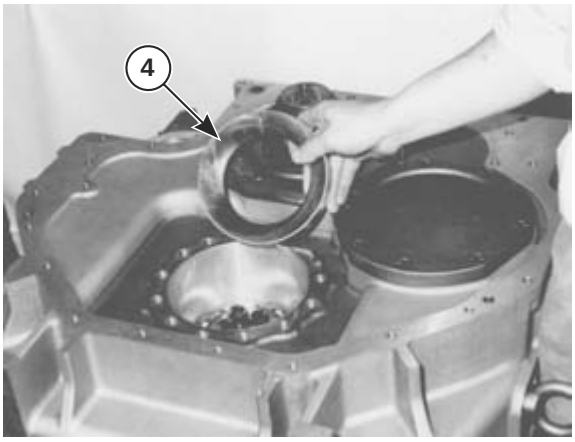
2. Remove the output shaft spacer (2) and shims (3).



19-4-009

Figure 46. Output Shaft Spacer (2) and Shims (3) Removal

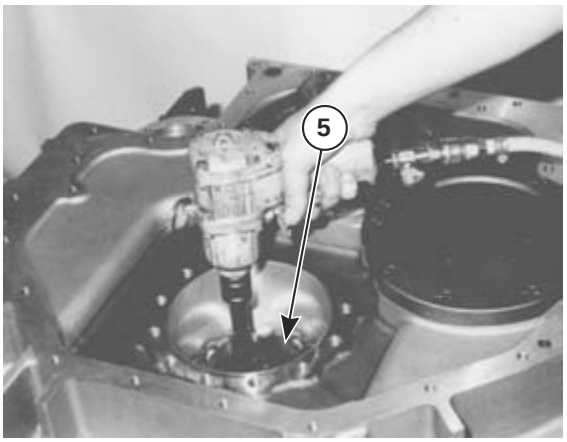
3. Remove the output shaft bearing cup (4).



19-4-012

Figure 47. Output Shaft Bearing Cup (4) Removal

4. Remove four screws (5) . Insert screw M10-1.5 into the threaded screw locations of the bearing carrier end plate and pull on the screws to remove the bearing carrier and bearing.



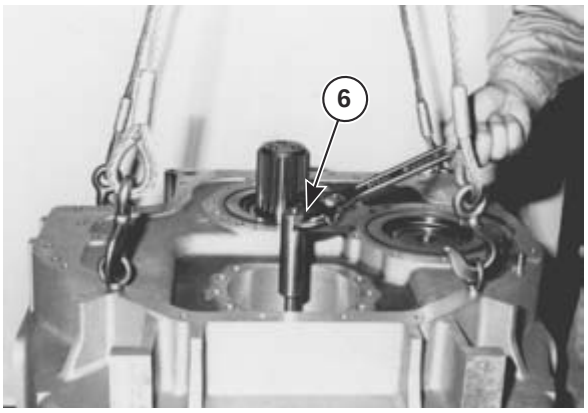
19-4-014 19-4-016

Figure 48. Output Shaft Front Bearing Carrier and Spherical Roller Bearing Removal

5. Install the special tool (6) (oil injection adapter tool) T-21482-8 into the end of the output shaft.

   Note: Support housing with a hoist. Raise housing to provide clearance to separate output bearing and shaft.

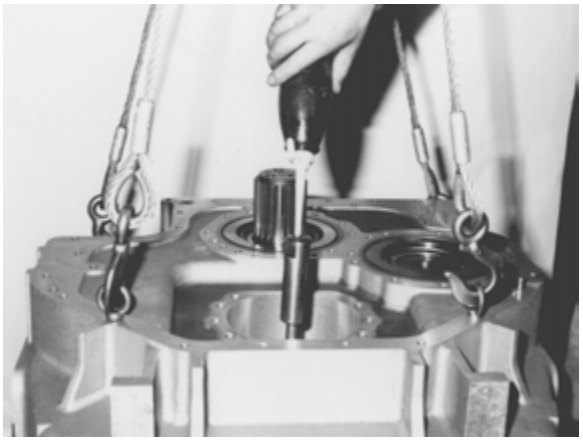
   a. Identify the location of the oil injection port. The proper port is the shallowest hole in the end of the shaft that contains a continuing passage through to the bearing.
   b. Fill the shaft passage with SAE 40W oil.
   c. Wrap the threads of the oil injection adapter into the oil injection port in the end of the shaft.



2136-025

Figure 49. Oil Injection Adapter Tool (6) Installation

6. Fill the oil injection adapter with SAE 40W oil. Lightly tap the oil injection adapter to remove air entrapped in the passage. Refill the passage with oil as required until the passage is filled and all traces of air are removed.



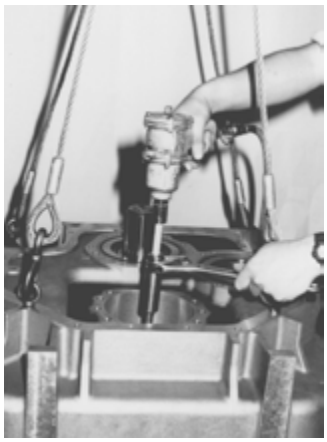
2136-026

Figure 50. Fill Oil Injection Adapter Tool

7. Wrap the threads of the injection adapter screw with Teflon® sealing tape.

8. Hold the injection adapter to prevent rotation during operation and use an impact wrench to drive the screw into the oil injection adapter until the output shaft and bearing surfaces separate

   Note: If the output shaft and bearing do not separate during the initial injection, repeat steps 1 through 8.



2136-027

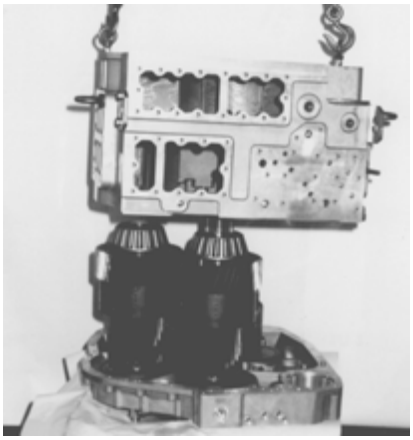
Figure 51. Separating Output Shaft and Bearing

Remove Primary and Secondary Clutch Assemblies

1. Lower housing and block securely.

2. Remove remaining capscrews that retain the rear housing to the transmission housing.

3. Lift transmission housing off of the rear housing.



19-2-015

Figure 52. Lift Transmission Housing From Clutch Shafts and Transmission Rear Housing

4. Install eyebolts to lift the primary and secondary clutch shaft assemblies away from the rear transmission housing.

   Eyebolts: M14-2 for primary and M16-2 for secondary.

   Note: Set aside the primary and secondary clutch shaft assemblies until further disassembly is required.

19-2-019

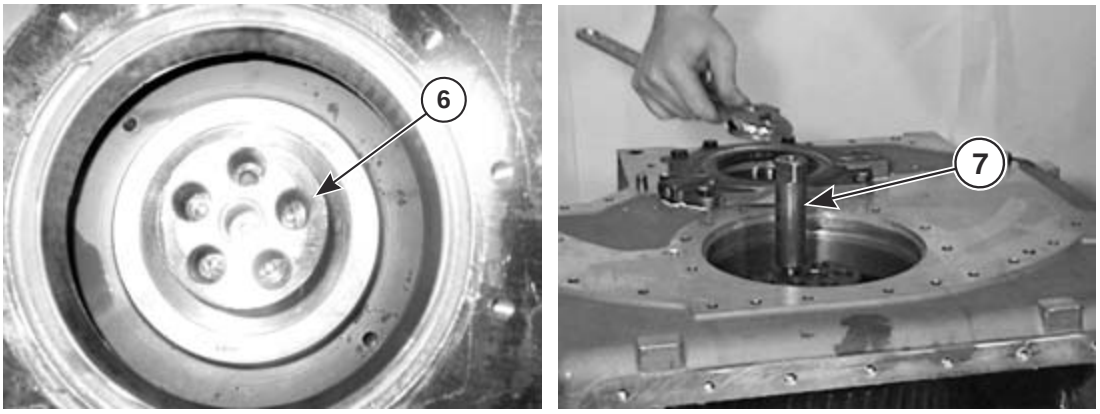
Figure 53. Lift Primary and Secondary Clutch Shafts from Rear Cover Transmission Housing

Remove Output Gear

1. Install special tool T-21482-15 to restrain the output gear.

2. Install special tool (oil injection adapter tool) T-21482-8 into the end of the output shaft.

   a. Indentify the location of the oil injection port (6). The proper port is the threaded hold in the end of the shaft that contains a continuing passage through the shaft to the shaft tapered surface at the output gear.
   b. Install special tool T-21482-21 to restrain the output gear.
   c. Fill the shaft passage with SAE 40W oil.
   d. Wrap the threads of the oil injection adapter (7) with Teflon sealing tape. Thread the oil injection adapter into the oil injection port in the end of the shaft.



AR6557053BE AR131-6557

Figure 54. Oil Injection Port (6) Location and Oil Injection Adapter Tool (7) Installation

3. Fill the oil injection adapter with SAE 40W oil. Lightly tap the oil injection adapter to remove air entrapped in the passage. Refill the passage with oil as required until the passage is filled and all traces of air are removed.

4. Install wood blocks between the output gear and rear housing to prevent damage to the trailing pump gear.

5. Wrap the threads of the injection adapter screw with Teflon sealing tape and install the screw into the oil injection adapter.

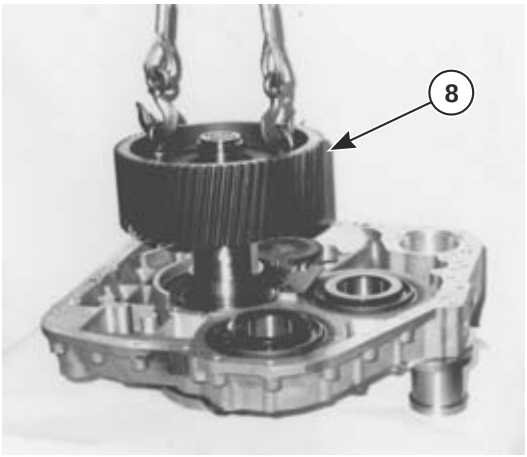
6. Hold the oil injection adapter to prevent rotation during operation and use an impact wrench to drive the screw into the oil injection adapter until the output shaft and output gear tapered surfaces separate.

   Note: If the shaft and gear do not separate during the initial injection, repeat steps 3 through 6.

⚠ WARNING

The gear and shaft will separate with extreme force, potentially causing great physical harm. Use EXTRA CAUTION and proper safety procedures.

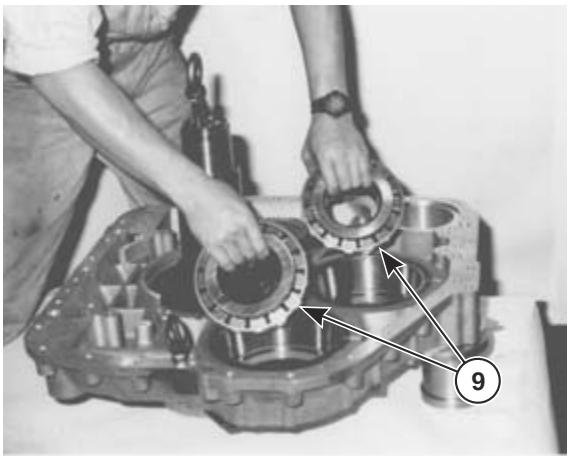
7. Install eyebolts to life the output shaft gear (8) from the transmission rear housing.



19-2-027

Figure 55. Output Shaft Gear (8) Removal

8. Remove the primary and secondary clutch shaft rear bearing (9) from the tranmission housing.



19-2-031

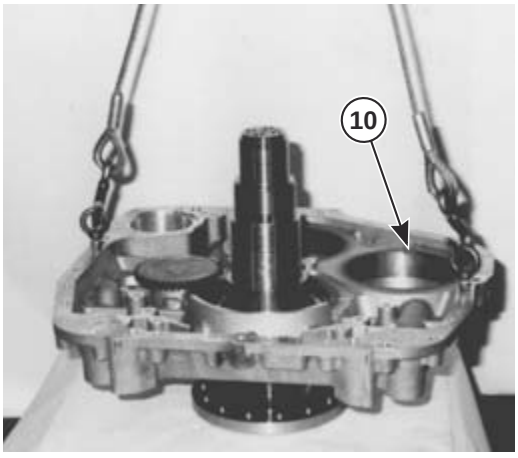
Figure 56. Clutch Shaft Rear Bearing (9) Removal

9. Remove the primary and secondary clutch shaft rear bearing outer race from the rear transmission housing.

10. Install M10 eyebolts to lift the transmission rear cover (10) from the output shaft.

11. Remove the output seal retainer screws before lifting.

12. Lift housing.

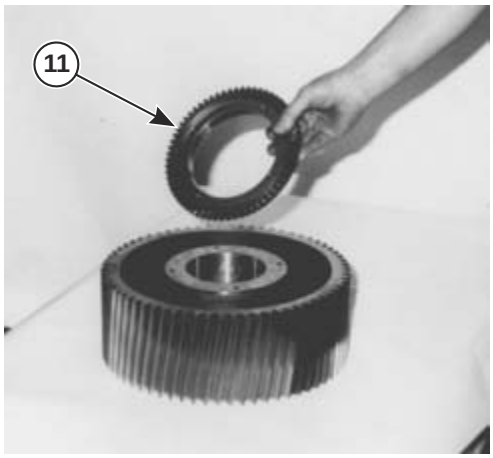


19-1-003

Figure 57. Lifting Transmission Rear Housing (10)

13. Remove the trailing pump drive gear (11) from the output gear only if parts replacement is required.

    a. A spacer is used between the trailing pump drive gear and the output gear.
    b. Refer to Output Shaft Disassembly information of this manual for detailed shaft disassembly information.



19-1-016

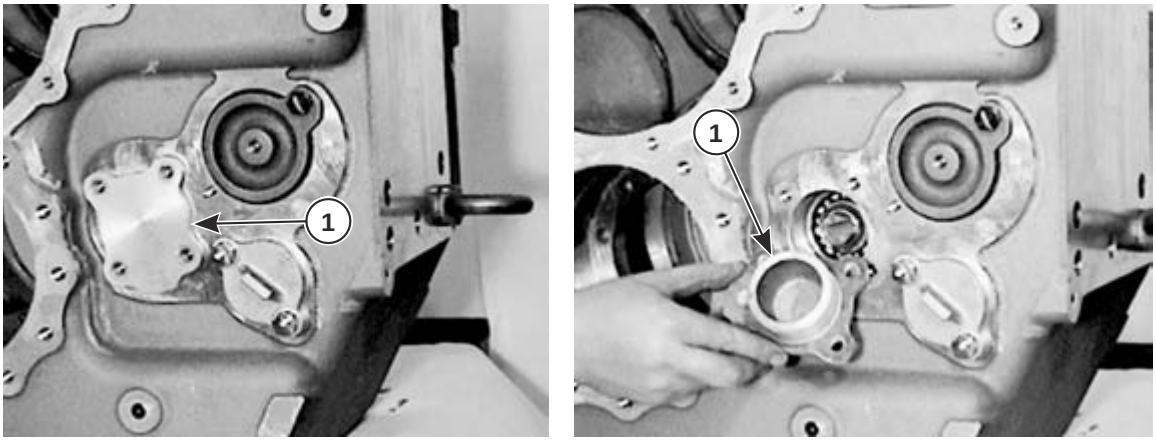
Figure 58. Trailing Pump Drive Gear (11) Removal

Trailing Pump and Shaft

Pump/Cover and Shaft

1. Place the transmission in the upright position. Be sure transmission is supported securely.

2. Remove the trailing pump/cover (1) from the rear of the transmission.



AR148-6557 AR149-6557

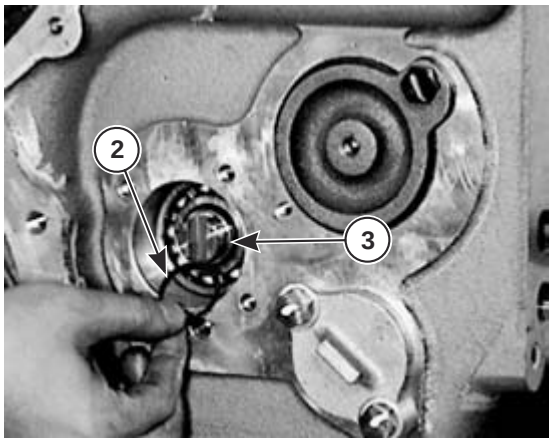
Figure 59. Trailing Pump Cover (1) Removal

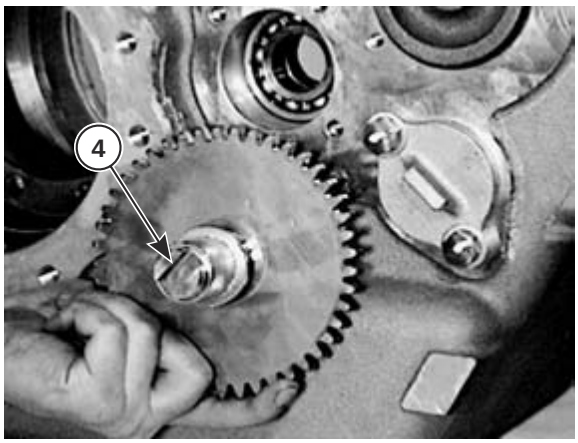
3. Remove the external snap ring (2) from the trailing pump driven shaft (3).

4. Use special tool T-21482-17 to drive the shaft (4) out of the bearings and into the rear transmission housing. Use two M10-1.5 x 50 screws to install the special tool.

⚠ CAUTION

Use extreme caution when removing the trailing pump drive shaft to prevent damage to the drive slot in the end of the shaft. The trailing pump drive shaft and gear are not serviced separately. The trailing pump drive gear and shaft are serviced as an assembly (as a single part number).



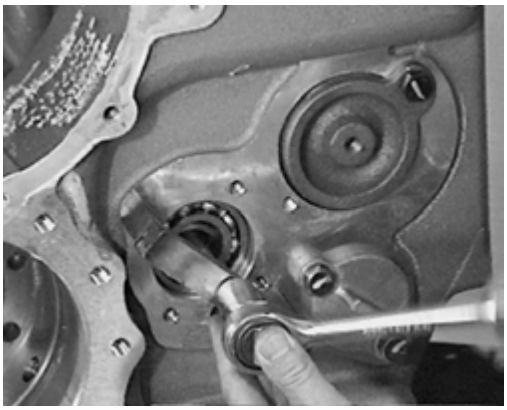


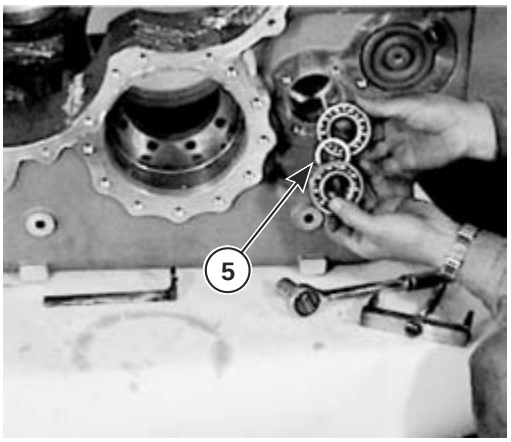
AR151-6557 AR153-6557

Figure 60. Trailing Pump Drive Shaft (4) Removal

Bearing

Reinstall special tool T21482-17. Pull the trailing pump shaft bearings and spacer (5) out the back of the transmission housing. The spacer is located between the two ball bearings.



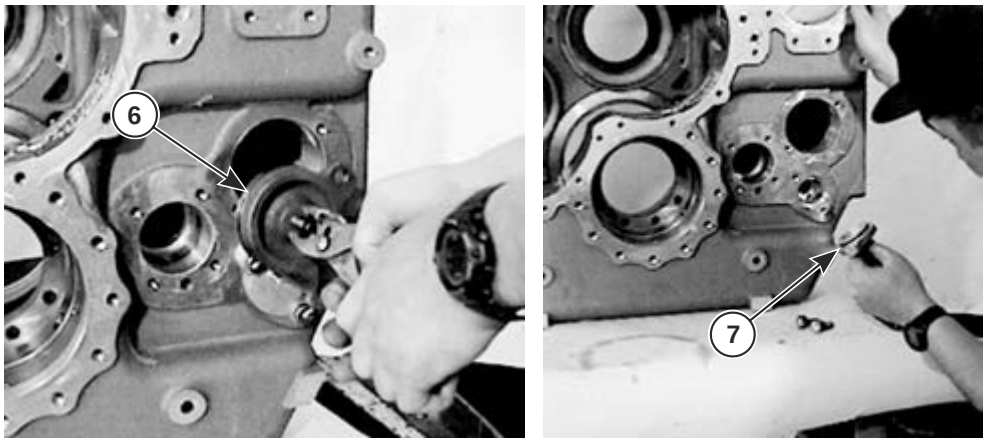


R156-6557 AR157-6557

Figure 61. Trailing Pump Shaft Bearings and Spacer (5) Removal

Other Components

Remove the governor cover (6) and trailing pump suction strainer cover (7). Each cover is sealed with an O-ring.



AR158-6557 AR160-6557

Figure 62. Governor Cover (6) and Trailing Pump Suction Strainer Cover (7) Removal

Primary and Secondary Clutch Shaft, Output Shaft, and Ditch Plate Disassembly

Primary Clutch Shaft

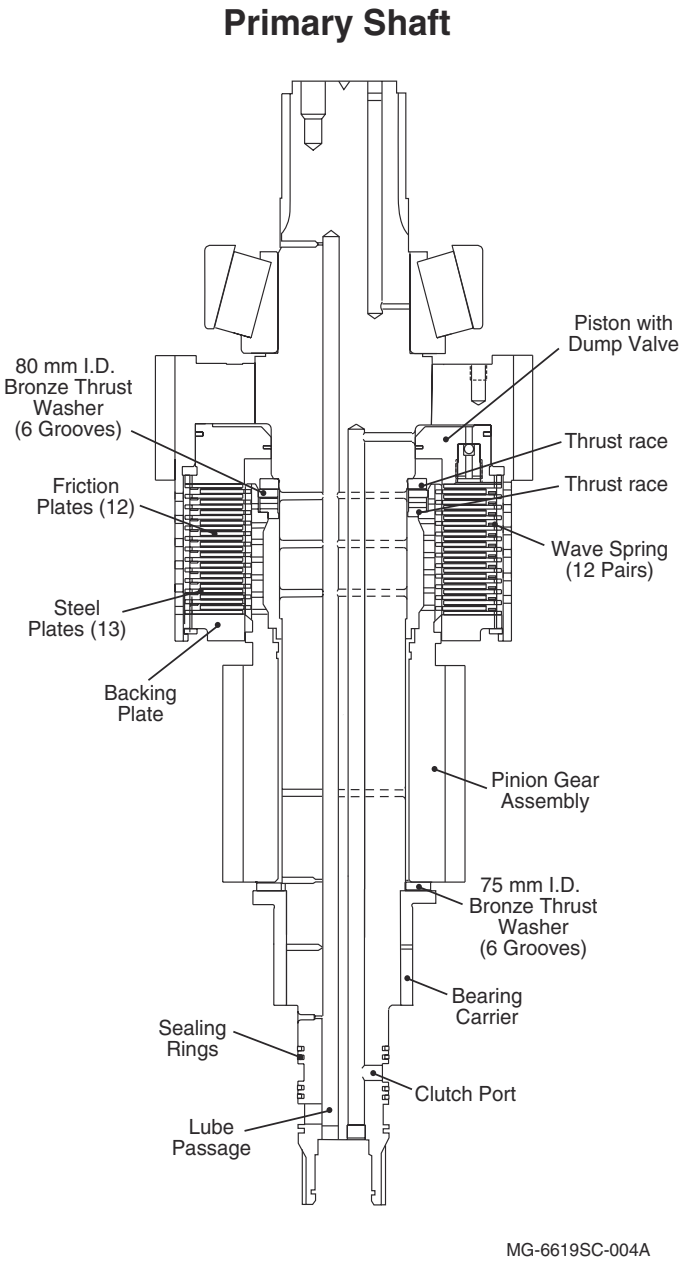
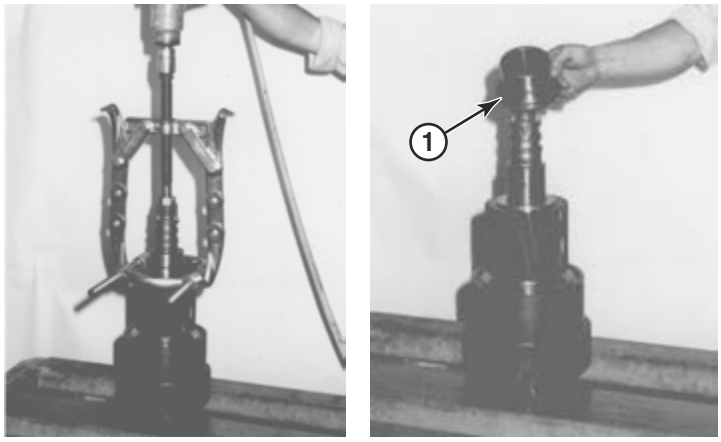


Figure 63. Primary Clutch Shaft Component Identification and Location

1. Remove the shaft bearing carrier (1) from the shaft.

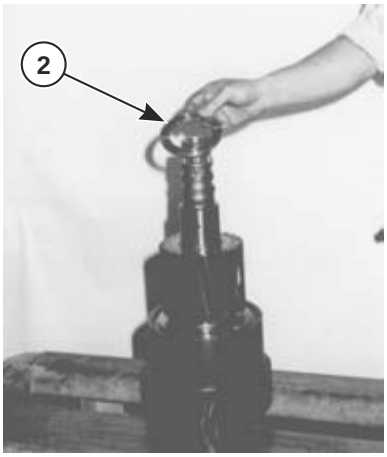


2135-017 2135-018

Figure 64. Shaft Bearing Carrier (1) Removal

2. Remove the rear 75 mm I.D. bronze thrust washer (2).

Note: The rear bronze thrust washer is equipped with six radial grooves (both sides) around the thrust washer for lubrication purposes.

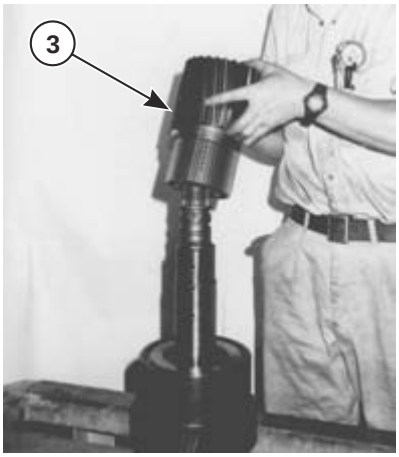


2135-019

Figure 65. Bronze Thrust Washer (2) Removal

3. Remove the pinion gear assembly (3). Tag the pinion assembly with identifying information. This ensures the gear will be installed in the same location where it was removed. The thrust race that pilots in the bore of the pinion may remain with the pinion when removed.

4. Install two clamps (4) on the transfer gear and backing plate to compress the clutch wave springs. Compress the clutch until the internal retaining ring in the clutch can be removed.



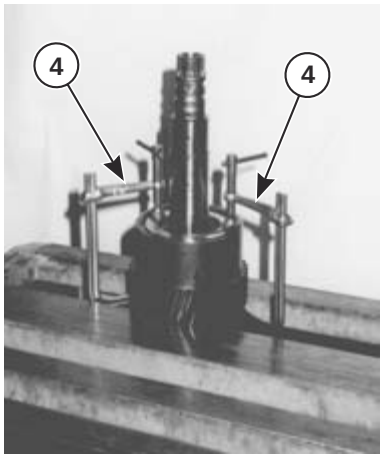


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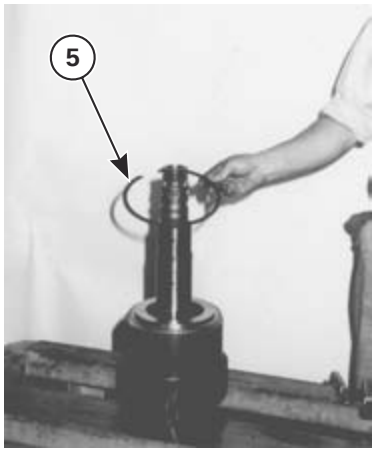
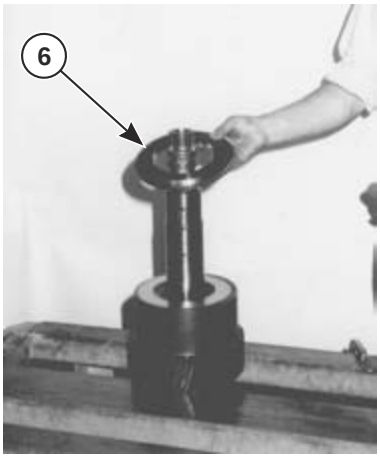
Figure 66. Pinion Gear Assembly (3) and Clamping Clutch Backing Plate (4)

5. Remove the internal retaining ring (5) from the clutch (retains the clutch backing plate). Remove the bar clamps from the clutch assembly.

6. Remove the clutch backing plate (6) from the clutch.



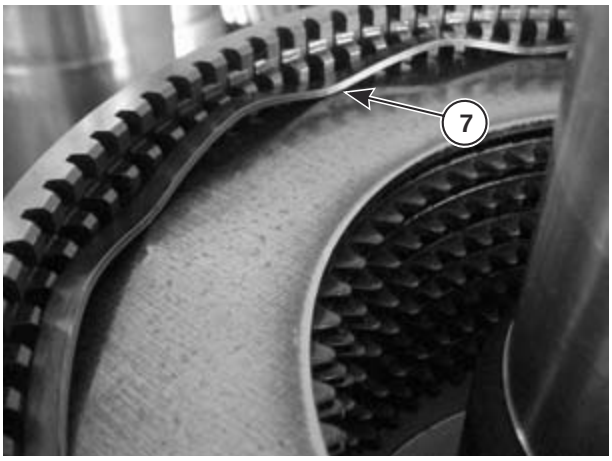


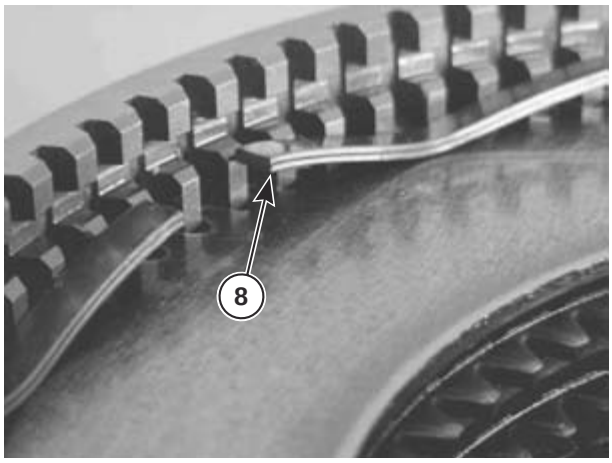
2135-023 2135-024

Figure 67. Internal Retaining Ring (5) and Clutch Backing Plate (6) Removal

7. Remove the steel clutch plates (quantity 13), the friction clutch plates (quantity 12), and the wave springs (7) (quantity 12 pairs).

   Note: Some early units use only a single wave spring between clutch plates. There are only 10 wave springs on these units.



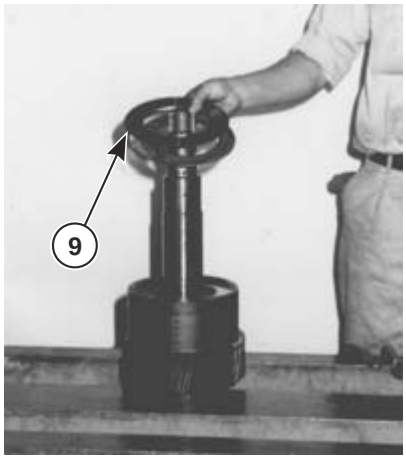


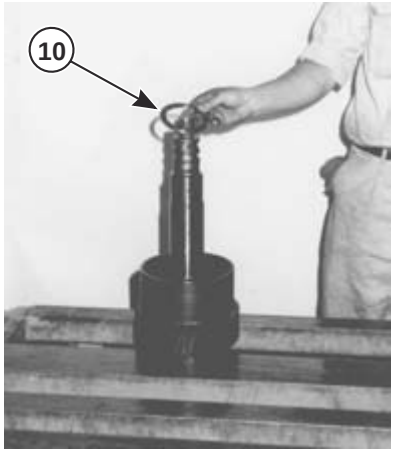
ARMVC026FGS ARMVC028FGS

Figure 68. Clutch Wave Spring (7 and 8) Removal

8. Remove the clutch plates (9).

9. Remove the thrust race, inner bronze thrust washer (10) and other thrust race (11). The inner bronze thrust washer (closest to the clutch piston) has six radial grooves on each side.





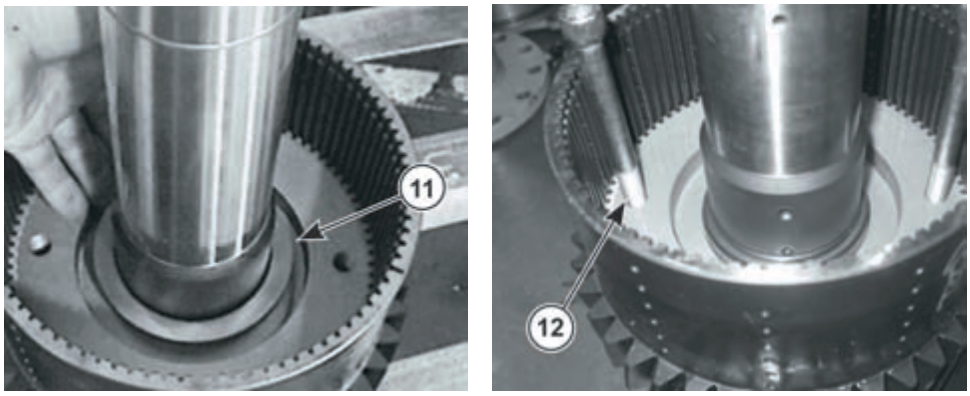
2135-025 2135-026

Figure 69. Clutch Plates (9) and Bronze Thrust Washer (10) Removal

Note: Rotating the thrust race during removal will ease the process.

10. Some clutch pistons are equipped with threaded holes to insert pulling screws (12), assisting in removing the clutch piston. Thread two M12-1.75 x 200 mm capscrews into the clutch piston. Remove the clutch piston from the clutch.

Note: If the clutch piston does not have threaded holes, compressed air can be used to remove the piston.



191-6557 6557066BE

Figure 70. Steel Thrust Race (11) and Clutch Piston (12) Removal

11. Rotate the shaft using a hoist so the input end faces up.

12. Remove the clutch piston sealing rings.

13. Removal of the tapered roller bearing requires destruction of the bearing to facilitate removal. **DO NOT** remove the rear bearing unless replacement is required.

Secondary Clutch Shaft

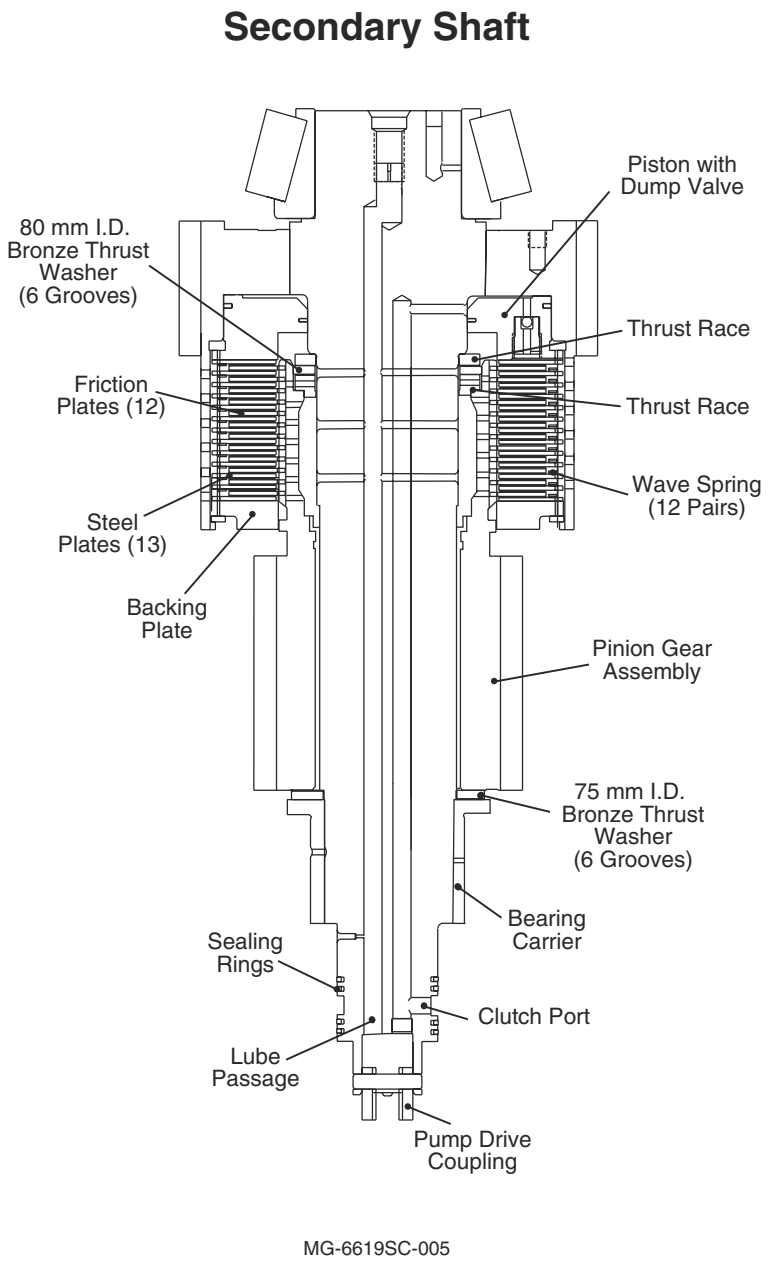
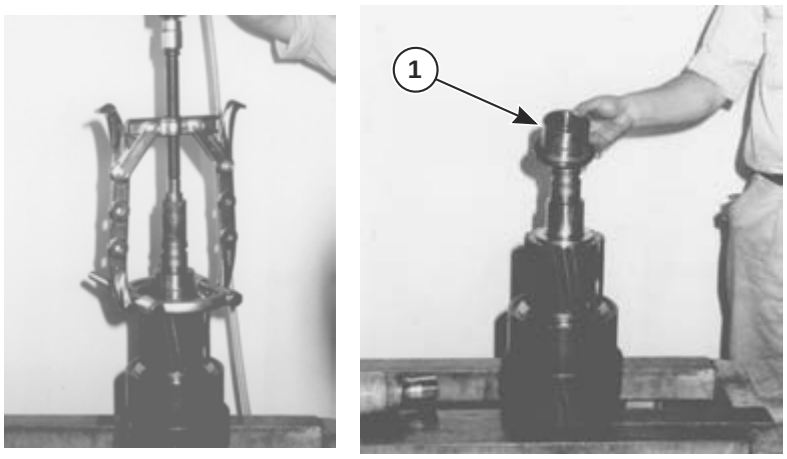


Figure 71. Secondary Clutch Shaft Component Identification and Location

1. Remove the shaft bearing carrier (1).

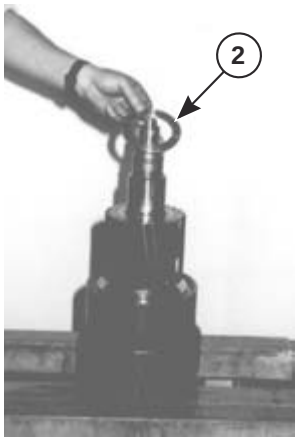


2135-029 2135-030

Figure 72. Shaft Bearing Carrier (1) Removal

2. Remove the bronze thrust washer (2).

Note: The rear bronze thrust washer is equipped with six radial grooves (both sides) around the thrust washer for lubrication purposes.



2135-031

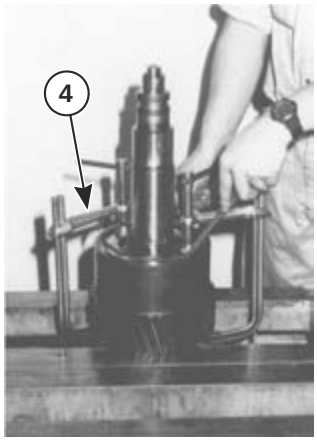
Figure 73. Bronze Thrust Washer (2) Removal

3. Remove the pinion gear assembly (3). Tag the pinion gear assembly with identifying information. This ensures the gear will be installed in the same location where it was removed. The thrust race that pilots in the bore of the pinion may remain with the pinion when removed.

2135-032

Figure 74. Pinion Gear Assembly (3) Removal

4. Install two clamps (4) on the transfer gear and backing plate to compress the clutch wave springs. Compress the clutch until the internal retaining ring in the clutch can be removed.

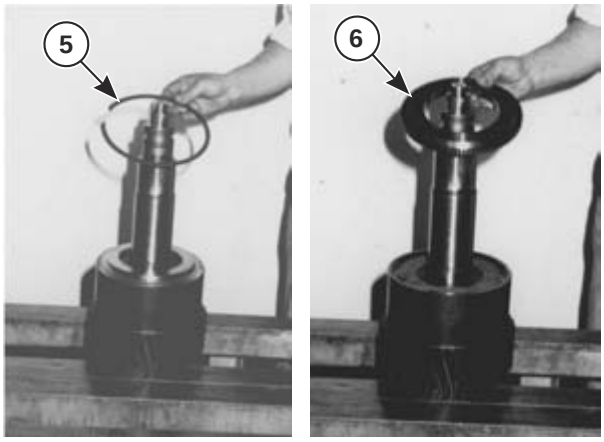


2135-033

Figure 75. Clamping Clutch Backing Plate (4) Removal

5. Remove the internal retaining ring (5) from the clutch (retains the clutch backing plate). Remove the bar clamps from the clutch assembly.

6. Remove the clutch backing plate (6) from the clutch.

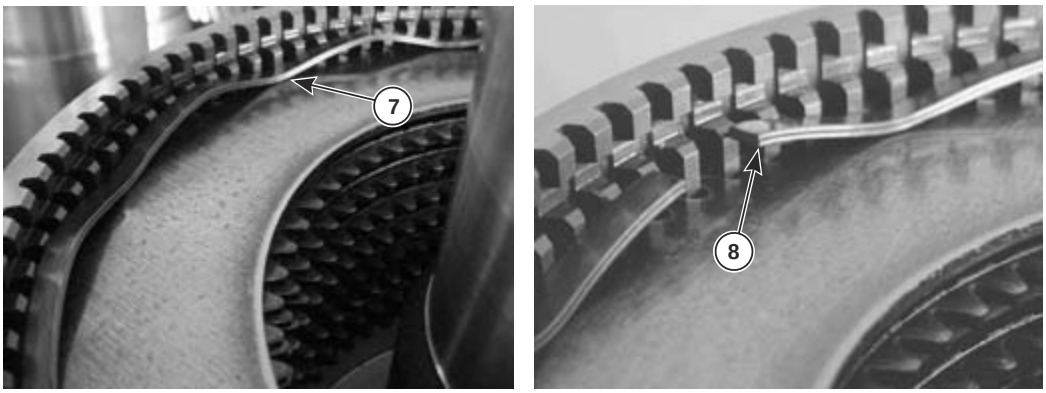


2135-034 2135-035

Figure 76. Internal Retaining Ring (5) and Clutch Backing Plate (6) Removal

7. Remove the steel clutch plates (quantity 13), the friction clutch plates (quantity 12), and the wave springs (7 and 8) (quantity 12 pairs).

Note: Some early units use only a single wave spring between clutch plates. There are only 10 wave springs on these units.

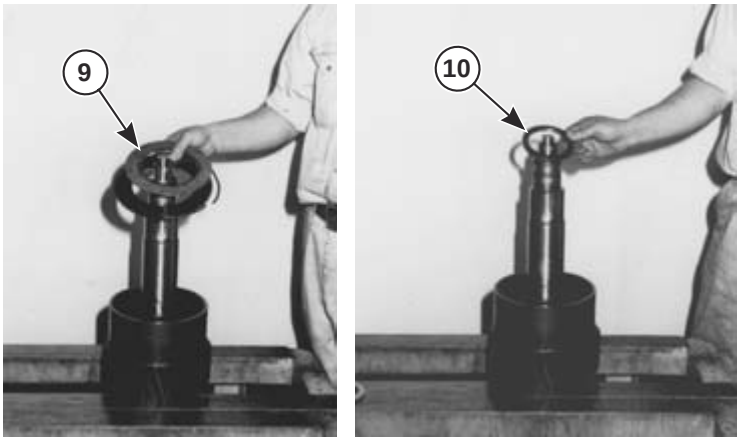


ARMVC026FGS ARMVC028FGS

Figure 77. Clutch Wave Spring (7 and 8) Removal

8. Remove the clutch plates (9).

9. Remove the thrust race, inner 80 mm I.D. bronze thrust washer (10) and other thrust race. The inner bronze thrust washer (closest to the clutch piston) has six radial grooves on each side.



2137-015 2137-014

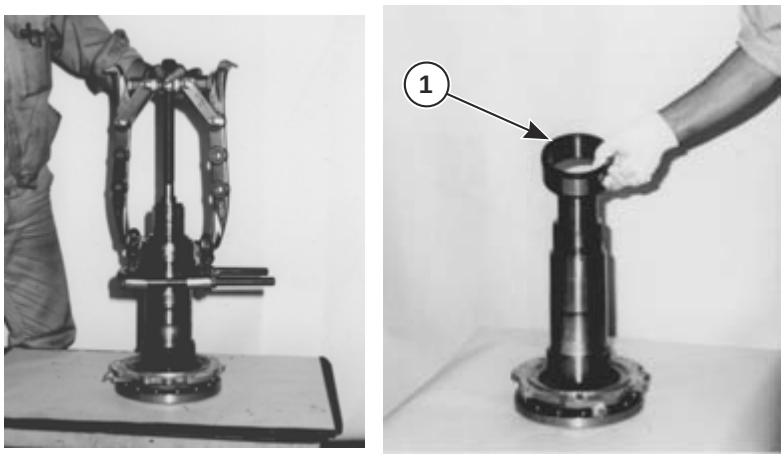
Figure 78. Clutch Plates (9) and Inner Bronze Thrust Washer (10) Removal

10. Repeat steps 10 through 13 as previously shown for Primary Clutch Shaft Disassembly.

11. **DO NOT** remove the drive pin from pump drive coupling unless part replacement is required. The pump drive coupling pin is retained by staking in two locations at both ends of the pin.

Output Shaft

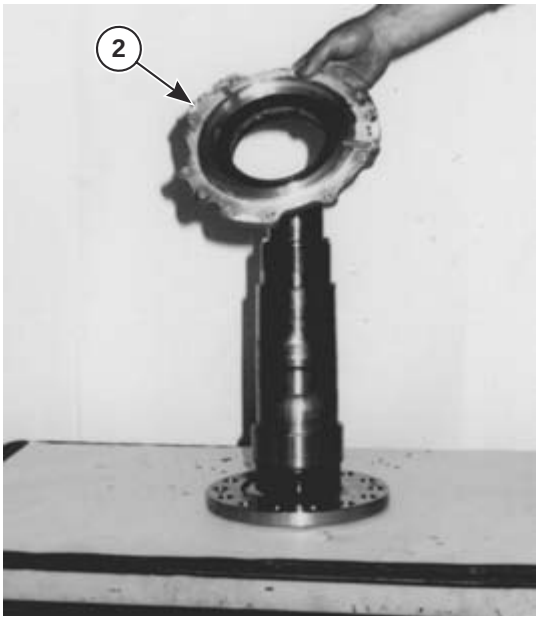
1. Remove spacer. Remove the output bearing inner race (1).



2135-008 19-1-018

Figure 79. Output Bearing Inner Race (1) Removal

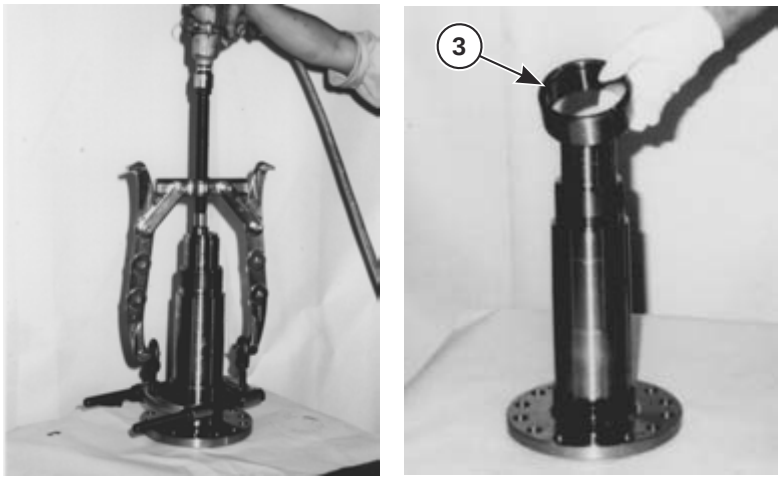
2. Remove the output shaft seal carrier (2).



2135-009

Figure 80. Output Shaft Seal Carrier (2) Removal

4. Remove the output oil seal wear sleeve (3).



19-1-027 19-1-025

Figure 81. Output Oil Seal Wear Sleeve (3) Removal

Ditch Plate

1. Remove the lubrication oil pressure relief valve (4) by removing the two hex head cap screws and washers. Thread a M8-1.25 screw into the sealing plug and pull it from the ditch plate. Remove the spring, retainer, and steel ball from the bore of the ditch plate.

2. Remove the hex head screw and sealing washer from the lubrication oil priority valve (5). Remove the spring, valve spool, and the remaining spring from the bore in the ditch plate.

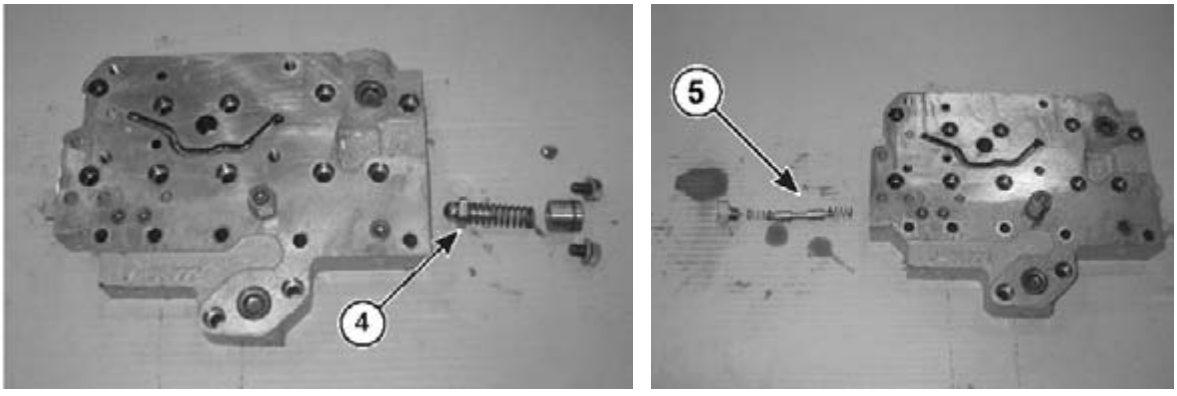


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Figure 82. Ditch Plate, Pressure Relief Valve (4), Lube Priority Valve (5)

Note: Some early units may have a built in relief valve.

Selector Valve Assembly -- Electric Valve

⚠ CAUTION

The steel ball is under pressure from the spring. Care must be taken when removing the cover and orifice plate to prevent loss of the steel ball.

1. Loosen and remove four of M8-25 socket head capscrews, and remove orifice plate cover and gasket.

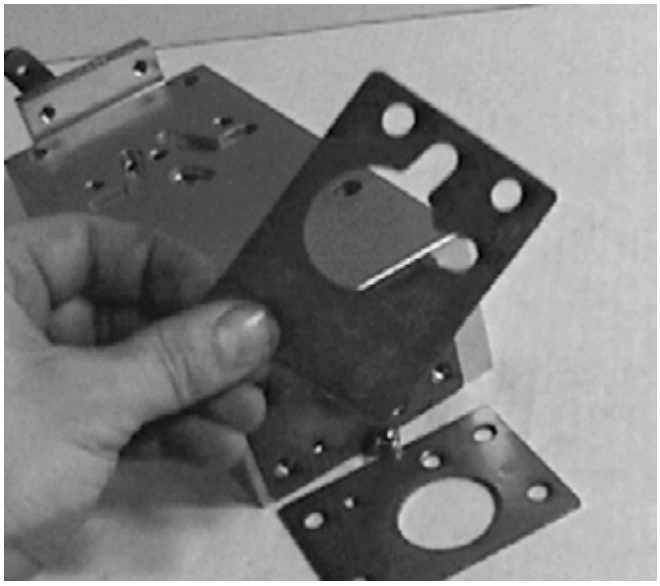

Figure 83. Removing Orifice Plate Cover Gasket

2. Remove orifice plate.

3. Remove steel ball and neutral pressure regulating spring.

4. Remove orifice plate gasket.

5. Remove screen and rate-of-rise piston. Note that shims are located between the piston and springs.

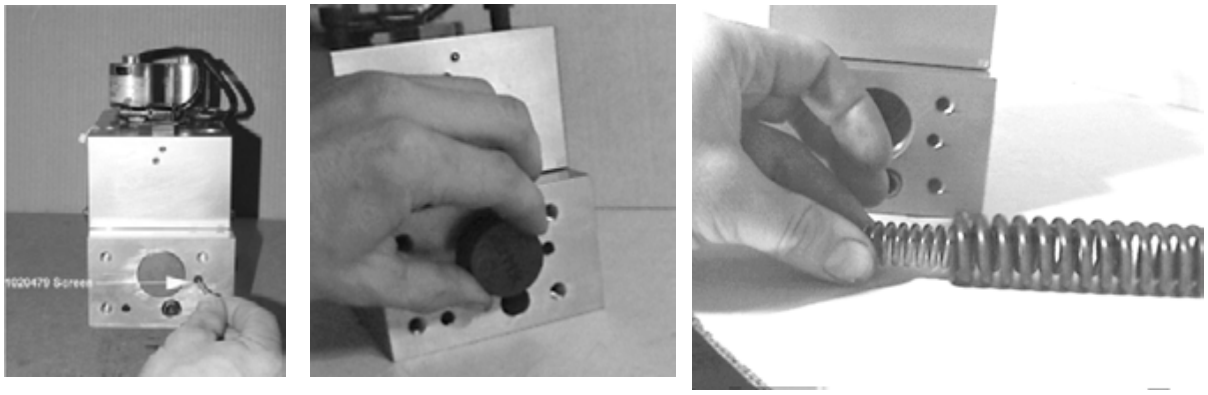

Figure 84. Rate of Rise Piston (left) and Regulator Springs (right)

6. Remove pressure regulating springs.

7. Remove pressure regulating piston with an external retaining ring pliers.

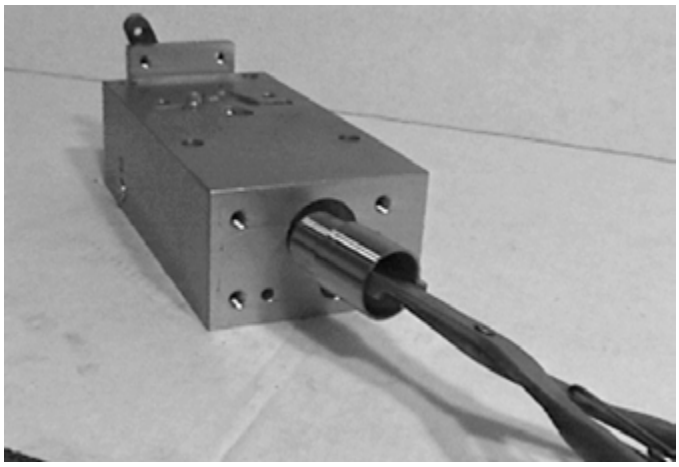

Figure 85. Removing Regulating Piston with Pliers

8. Remove external retaining ring from the lever end of the stem.

9. Loosen the clamping nut and remove the control lever from the stem. It may be necessary to splay the lever to be able to remove it. **DO NOT** apply any impact force to the lever, as the stem or dog-point setscrew might get damaged.

10. Remove the washer and spring from the stem.

11. Remove four of M8-25 socket head capscrews.

12. Remove the cover assembly with the gasket from the valve body.

13. Remove the O-ring and oil seal from the cover assembly.

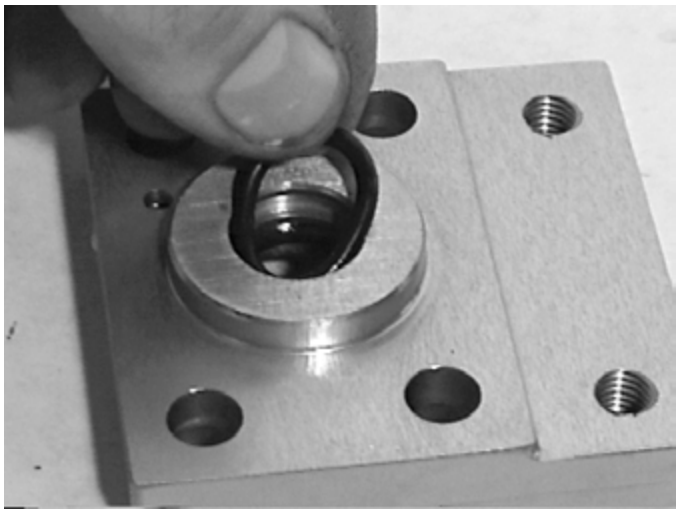

Figure 86. Removing O-ring from Cover

14. Remove the two electrical switches from the sides of the valve body and the two steel balls from each of the switch bores in the valve body (some models).

15. Remove the detent setscrew, spring, and steel ball from the valve body.

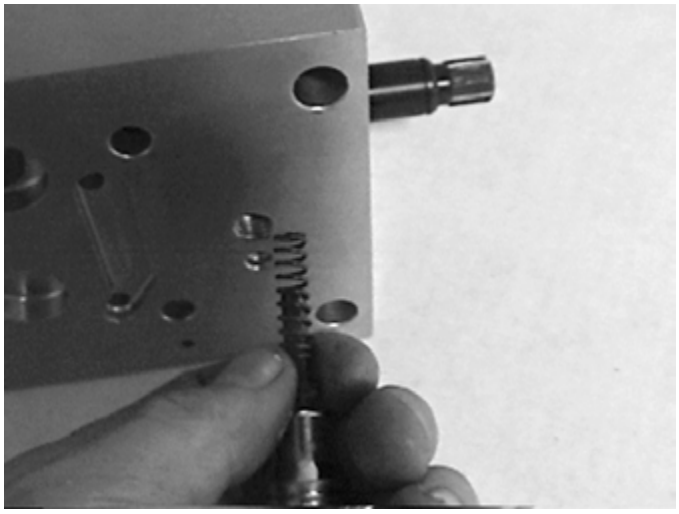

Figure 87. Removing Detent Setscrew and Spring

16. Remove the dog-point setscrew. Note that the setscrew is retained with MA908 threadlocker.

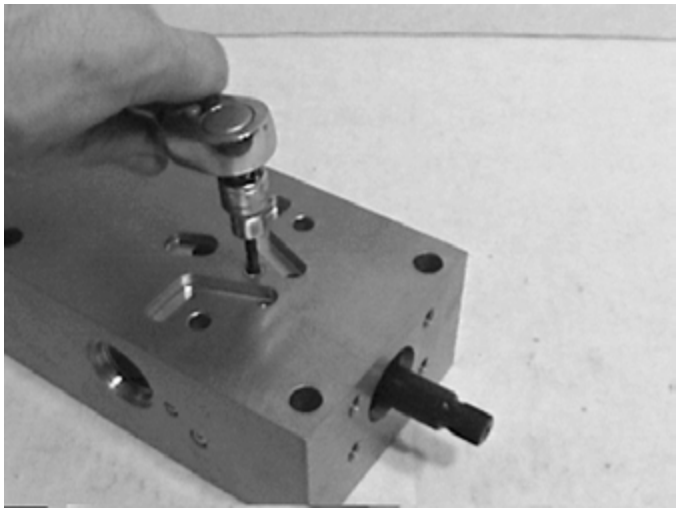

Figure 88. Removing Dog-point Setscrew

17. Remove the stem from the valve body partially.

18. Remove the thrust washer from the stem.

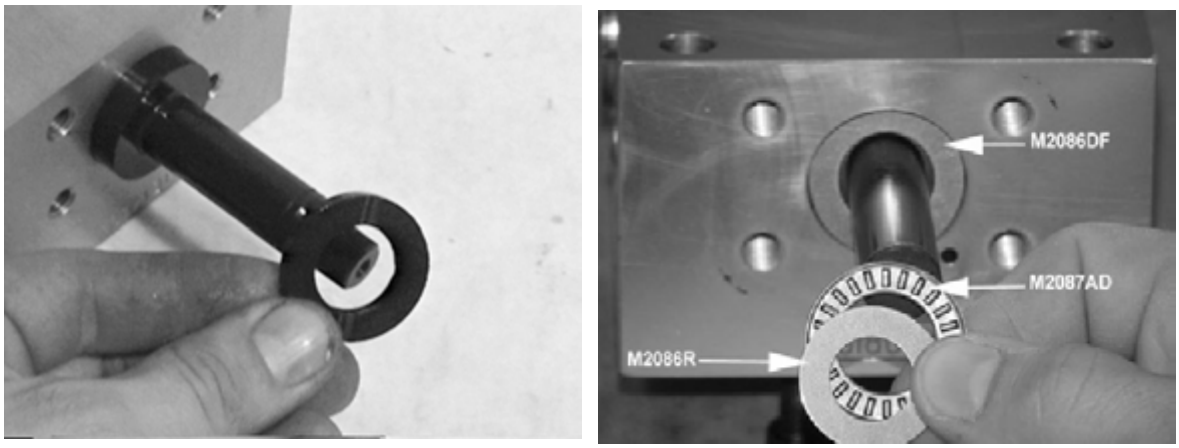

Figure 89. Removing Thrustwasher

19. Remove the stem from the valve body.

20. Remove the roll pin (retains the shuttle ball seat) with a needle-nose pliers.

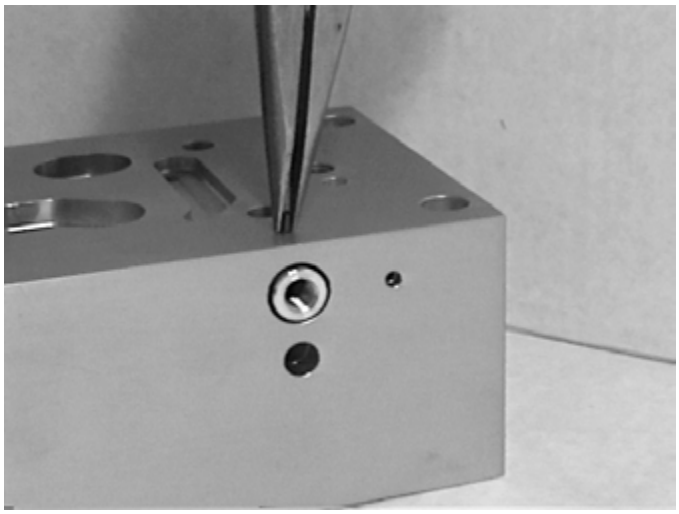

Figure 90. Removing Roll Pin Retaining Shuttle Seat

21. Thread a M8-1.25 screw (one of the cover screws works well) into the seat and remove it from the valve body.

22. Remove the shuttle ball from the valve body.

Upper Valve Body Half (Electric Section)

1. Remove the Weatherpak® connector from the valve body by sliding it in the direction of the opening in the shroud.

2. Mark the wires with the location letters that are on the Weatherpak® connector. Open the end of the Weatherpak® connector to allow removal of the pins and wires.

3. Remove the pins (for the wires of all but one solenoid) from the Weatherpak® connector using the extraction tool.The tool is Packard Electric P/N 12014012.

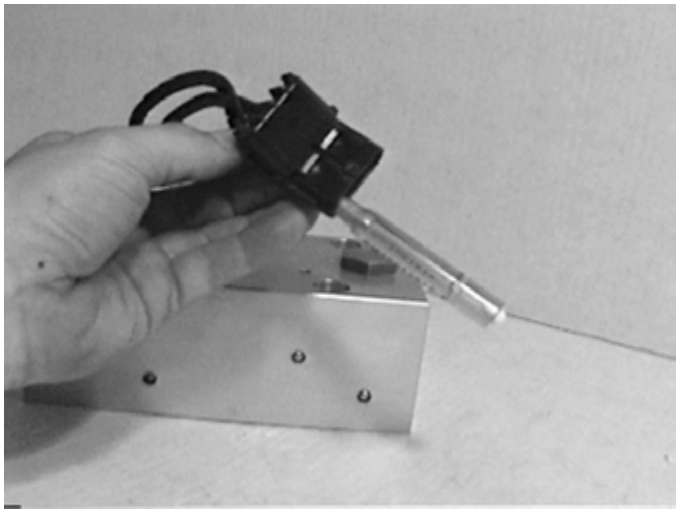

Figure 91. Removing Wires using Extraction Tool

4. Mark the two solenoids for location identification and remove them.

5. Remove the third (Neutral) solenoid (units with hydraulic lock) or plug (units without hydraulic lock).

6. Remove the filter screen from the valve body.

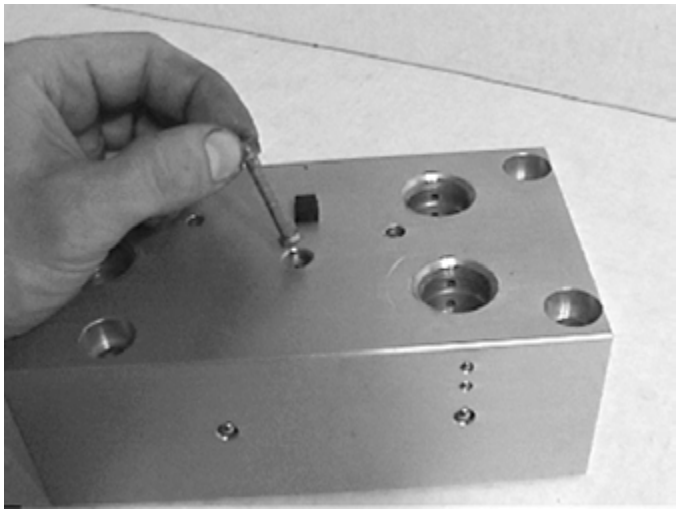

Figure 92. Removing Filter Screen

7. Remove the two socket head O-ring plugs from the bores in the end of the valve body.

8. Remove the two spools from the valve body.

9. Remove one dowel pin and spring from each of the spools (hydraulic lock units only).

10. Remove the spool return spring and dowel pin from the bottom of each of the spool bores in the valve body.

1017555 Trolling Valve (Optional Equipment)

1. Remove the trolling valve attaching screws.

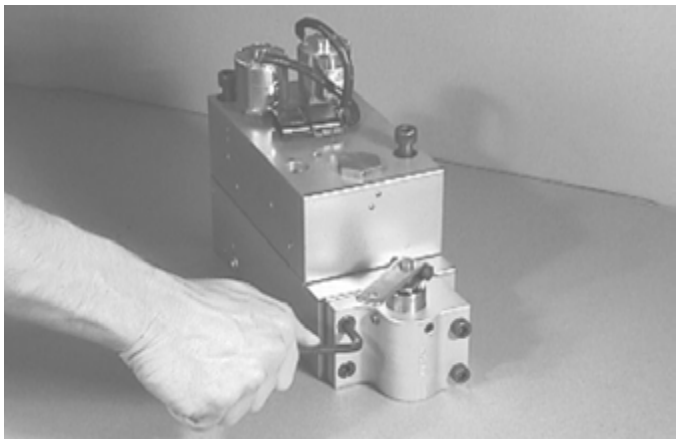

Figure 93. Removing Trolling Valve Attaching Screws

⚠ CAUTION

Steel ball is under pressure from the spring. Care must be taken when removing the trolling valve and orifice plate to prevent loss of steel ball.

2. Remove the trolling valve from control valve.

3. Remove the gaskets, orifice plate, and steel ball from control valve.

4. Remove the screw and nut clamping the lever to the stem.

5. Remove the lever from the stem. It may be necessary to splay the lever to be able to remove it. **DO NOT** apply any impact force to the lever, as the stem or dog-point setscrew might be damaged.

6. Remove the detent setscrew, spring, and detent ball.

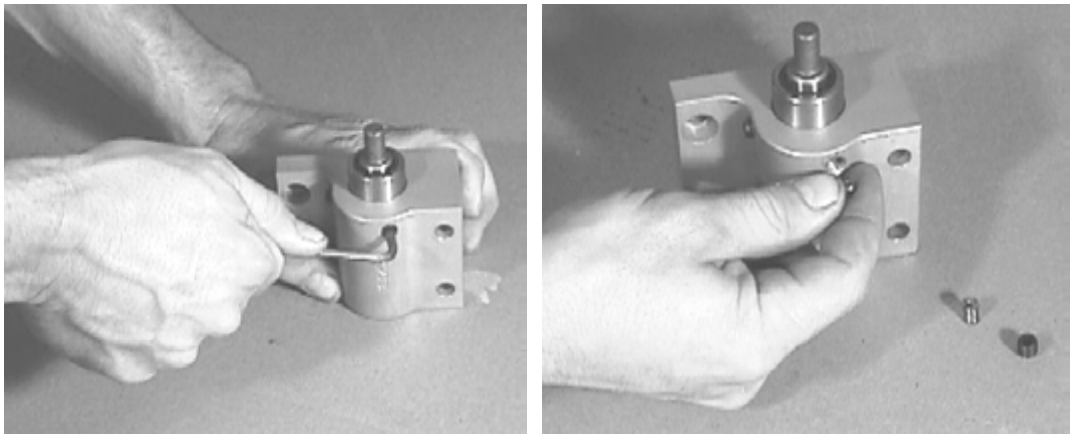

Figure 94. Removing Detent Setscrew (left) and Detent Spring and Ball (right)

7. Remove the dog-point setscrew from the valve body.

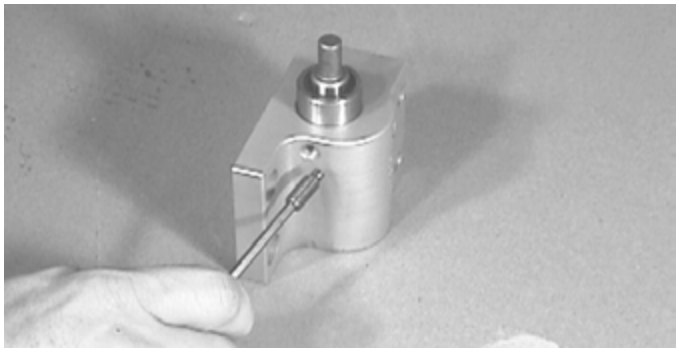

Figure 95. Removing Dog-point Setscrew

8. Slide the stem and adapter out of the valve body together as one piece. Push the stem out of the adapter so the spring end of the stem exits the adapter first. Note that the inner spring will come out with the stem.

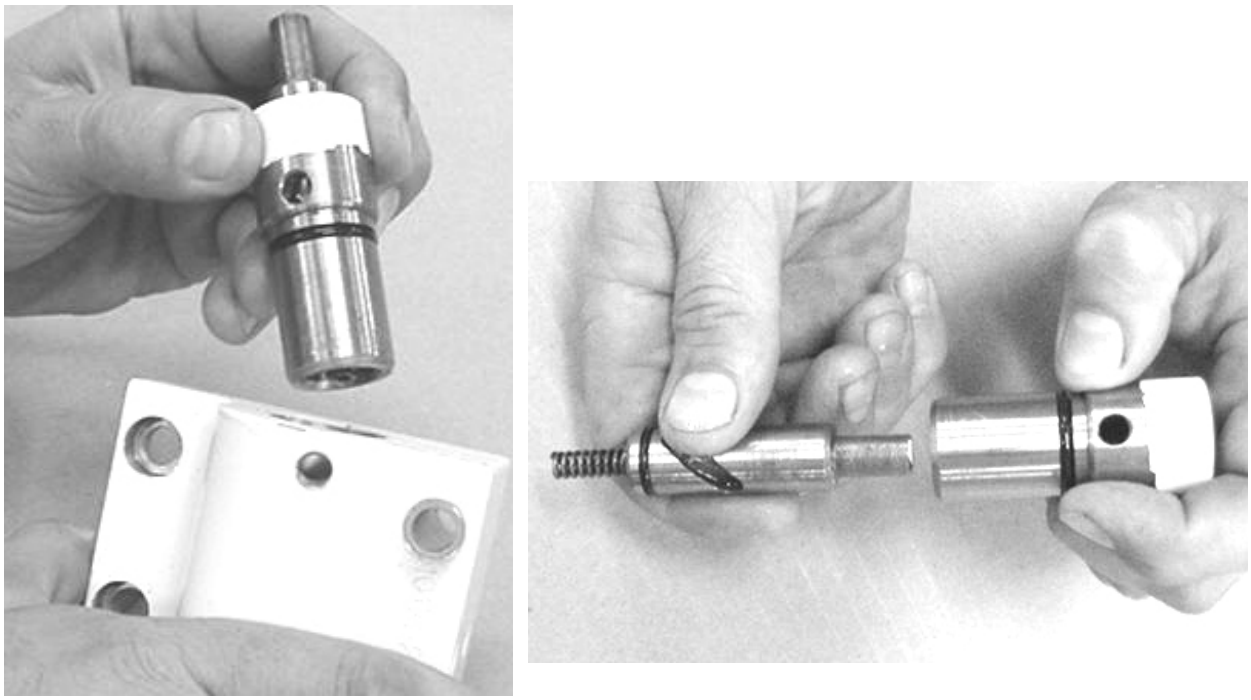

Figure 96. Removing Stem and Adapter from Valve Body (left) and Removing Stem from Adapter (right)

9. Remove the O-ring from the groove in the end of the stem.

Figure 97. Removing O-ring from Stem

10. Remove the inner spring and roll pin from the stem only if part replacement is necessary.

11. Remove the washer from the bore of the valve body (some models).

    Note: The washer may have been removed with the stem.

12. Remove the (outer) spring and piston from the bore of the valve body.

    Note: There may be washer(s) in the bore of the piston (some models).

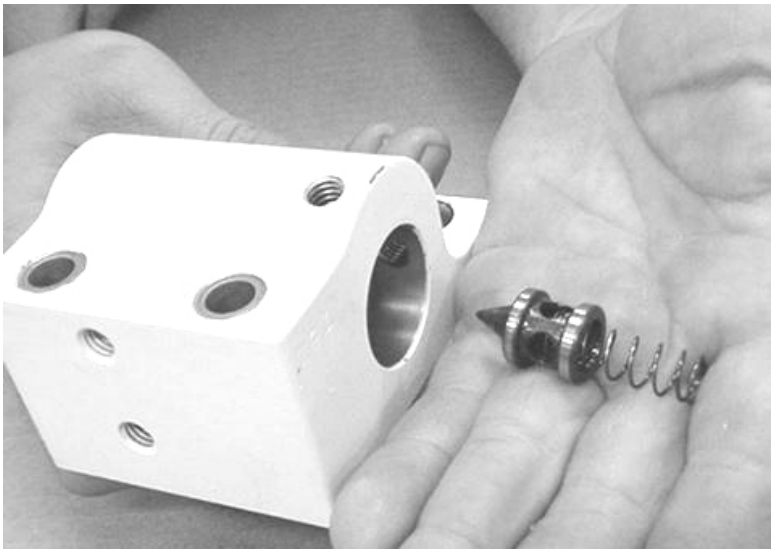

Figure 98. Removing Spring and Piston from Valve Body

13. Remove the O-ring from the groove and the oil seal from the end of the adapter.

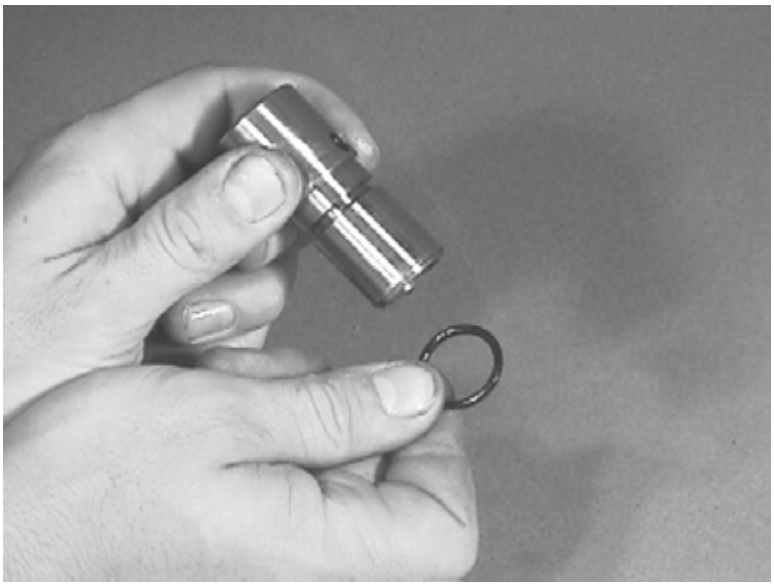

Figure 99. Removing O-ring from Adapter

NOTES

Cleaning and Inspection

Cleaning

Note: Replace all oil seals, gaskets, O-rings, piston rings, seal rings and snap rings as a part of any maintenance or overhaul procedure. Replace shims that are damaged or destroyed in disassembly.

- ❑ Clean all parts using EPA/OSHA approved solvents or by steam cleaning. Parts must be dried and oiled immediately to prevent corrosion.
- ❑ Examine all parts carefully for grit, dirt and abrasives and reclean them if necessary.
- ❑ Clean all oil passages by working a piece of wire back and forth through the passages and then flushing them with cleaning solvent.
- ❑ Use clean solvent to flush oil pumps and valves.
- ❑ Flush all hoses, tubing and coolers, particularly if the unit is being disassembled because of an internal failure.
- ❑ De-burr the housing and bearing carrier with a stone or file in the vicinity of all pusher screw locations.

Cleaning Bearings

DO NOT remove grease in which new bearings are packed. Thoroughly wash bearings that have been in service. Soak bearings in solvent if they are particularly dirty or filled with hardened grease.

⚠ CAUTION

Never dry bearings with compressed air. DO NOT spin unlubricated bearings. Oil bearings with SAE 10 engine oil immediately after cleaning. Oil bearings before inspection.

Preventing Dirt from Entering into Bearings

Dirt and grit in bearings are often responsible for bearing failure; consequently, it is important to keep bearings clean. **DO NOT** remove grease from new bearings. Keep the wrapper on new bearings until they are installed. **DO NOT** expose clean bearings if they are not to be assembled at once. Wrap them with a clean lint-free cloth or paper to keep out dust.

Previously Sealed Joints

- ❑ For previously sealed joints, scrape surfaces to remove old gasket material or silicone.
- ❑ Clean surfaces with solvent to remove oil and grease residue.
- ❑ Test for clean surfaces by applying a few drops of cool water to the surfaces. Parts are sufficiently clean if water covers the surface in a film. If the water puddles or forms beads, use fresh solvent and reclean.

Inspection

Housings, Cast Parts, and Machined Surfaces

- ❑ Replace cast parts or housings that are cracked.
- ❑ Inspect bores for wear, grooves, scratches and dirt. Remove burrs and scratches with crocus cloth or soft stone. Replace deeply grooved or scratched parts. **DO NOT** remove excess material by sanding. This will cause loss of press of bearings or races.
- ❑ Inspect oil passages for obstructions. If you find an obstruction, remove it with compressed air or work a wire back and forth through the passage and flush it with solvent.
- ❑ Inspect machined surfaces for burrs, scratches, nicks and foreign matter. If you cannot remove the defect with crocus cloth or a soft stone, replace the part.
- ❑ Inspect ground tapers for burrs or nicks. If you cannot remove the defect with a soft stone, replace the part.
- ❑ Inspect ground tapers for scratches, galling or scoring damage. If you find any of these defects, replace the part.
- ❑ Inspect threaded openings for damaged threads. Chase damaged threads with a tap of the correct size.
- ❑ Inspect studs for damaged threads and looseness. Replace defective studs.
- ❑ Inspect dowel pins for wear or damage. Replace defective dowels. This applies where a matched set of parts is not involved.
- ❑ Inspect dowel pin holes for wear due to movement between mating parts. If a dowel pin hole is worn, re-bore and sleeve the hole when possible. Otherwise, replace the parts. This applies where a matched set of parts is not involved.

Valve Seats

Inspect valve seats for burrs, nicks and scratches. If you cannot remove these defects with a crocus cloth, replace the part. Check to see that the valve is seating properly after reworking the valve seat.

Bearings

- ❑ Inspect bearings for rotation roughness. Replace the bearing if the rotation is rough.
- ❑ Inspect bearings for corrosion, and for wear indication on balls or rollers. Inspect for scored, scratched, cracked, pitted or chipped races. If you find one of these defects, replace the bearing.
- ❑ Inspect bearing bores and shafts for grooved, burred, or galled conditions that would indicate the bearing has been turning in its housing or on its shaft. If you cannot repair the damage with a crocus cloth, replace the part.

Bushings and Sleeves

Inspect bushings for size and out-of-roundness. Inspect for scores, burrs, sharp edges, and evidence of overheating. Remove scores with a crocus cloth. If the bushing is out-of-round, deeply scored, or excessively worn, replace it.

Thrust Washers and Spacers

Inspect thrust washers for distortion, scores, burrs and wear. Rework or replace any defective thrust washers or spacers.

Gears

- ❑ Inspect gears for scuffed, nicked, burred or broken teeth. If you cannot remove the defect with a soft stone, replace the gear.
- ❑ Inspect gear teeth for wear that may have destroyed the original tooth shape. If you find this condition, replace the gear.
- ❑ Inspect thrust faces of gears for scores, scratches and burrs. If you cannot remove these defects with a soft stone, replace the gear.

Splined Parts

Inspect splined parts for stripped, twisted, chipped or burred splines. Remove burrs with a soft stone. Replace the part if other defects are found.

Springs

Inspect springs for broken or distorted coils. Replace the spring if either of these defects is found.

Flexible Hoses

Inspect all flexible hoses for cracks and sponginess. Replace damaged hoses.

Clutch Plates

Inspect clutch plates for signs of overheating, pitting, or excessive wear of the friction and splined surfaces. Replace the clutch plates if one of these defects is found. Refer to wear limits in Description and Specifications.

NOTES

Assembly

Note: Photos are for illustration purpse of the procedure and may not appear to be consistent with the previous assembly steps.

General

During service of this unit, all O-rings, gaskets and seals **must be** replaced.

Refer to cleaning and inspection information in this manual prior to assembly. It is good practice to compare the new parts with those being replaced during the assembly process (to make sure you don't mistake the quantity or size).

Flat washers are used under all fasteners where the head of the fastener contacts an aluminum surface.

Unless otherwise specified, all torque values listed are for capscrews that have been lubricated on the threads and contact surfaces.

Pipe threads called out as PT on drawings and in this text are different from NPT threads. PT threads and NPT threads are NOT interchangeable. Adapters are available from several manufacturers to convert PT threads to NPT threads.

Where grease is specified, use a lithium based grease (NLGI 2).

Submerge all new clutch friction plates in clean transmission oil for a minimum of one hour prior to installation.

This transmission uses liquid sealer in many locations. The approved sealant is Loctite® 518 (MA1015), applied per S774 (a thin layer of sealant is all that is required), with Locktite® Primer N (MA1012). Avoid getting sealant into the O-ring counter bores.

This transmission uses thread lockers MA908 and MA1007 at specified capscrew locations.

Note: The side of the transmission with the input and output flange is the front. The left and right sides are determined by facing the unit from the rear toward the front.

⚠ CAUTION

Appropriate eye protection must be worn during transmission assembly. To avoid personal injury, proper safety equipment must be used during installation of any heated bushings, bearings and other components.Output Shaft Subassembly

Oil Seal Sleeve

⚠ CAUTION

If the output shaft is damaged and cannot be repaired without material removal, replace the shaft.

1. Install an O-ring into the groove in the bore of the oil seal sleeve.

2. Use grease to retain the O-ring (1). Apply a thin film of grease to the output shaft, from approximately the middle of the shaft to the shoulder that stops the oil seal sleeve.

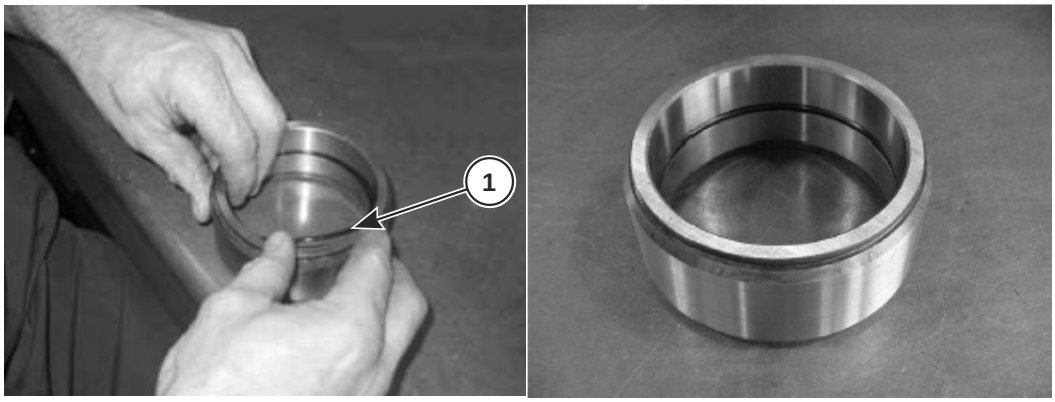

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Figure 100. Oil Seal Sleeve O-ring (1) Installation

3. Heat the oil seal sleeve to 100°C (212°F).

⚠ WARNING

Handle the oil seal sleeve with care. The sleeve is HOT.

4. Place the oil seal sleeve (2) away from the flanged end of the output shaft.

19-1-025

Figure 101. Output Shaft Oil Sleeve (2) Installation

5. Slide oil sleeve on until it contacts the shaft shoulder. Tap the end of the sleeve with a soft punch to ensure it is seated.

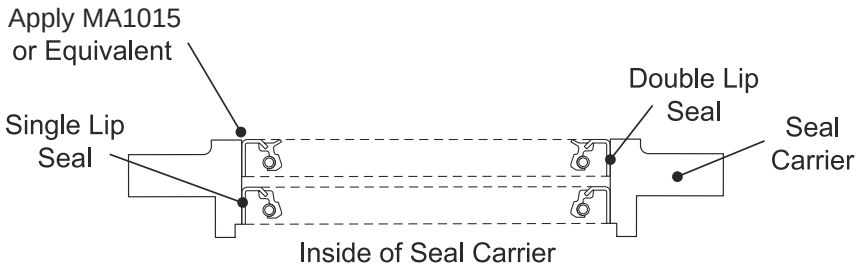

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Figure 102. Output Shaft Seal Carrier Components and Location

Oil Seal Carrier

19-1-019

Figure 103. Output Shaft Seal Carrier (3) Installation

1. Coat the O.D. of the oil seals and the bore of the oil seal carrier (3) with MA1015 sealer.

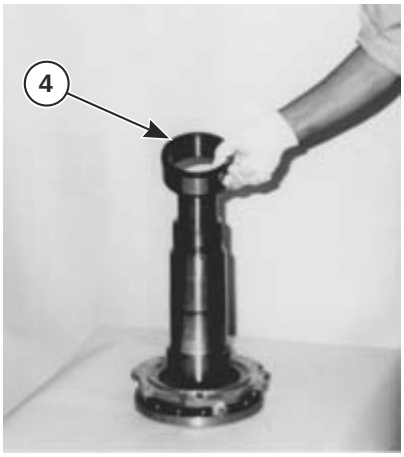
2. Install oil seals into the oil seal carrier.

   Note: The single lip oil seal is driven in until flush with the inside side of the oil seal carrier. The double lip oil seal is driven in until flush with the outside side of the oil seal carrier. Both seals have the spring-loaded lip toward the inside of the unit.

3. Apply lithium grease to the oil seal lips and oil seal sleeve. Fill the cavity between the oil seals with lithium grease.

4. Stop the oil seal carrier when the oil seals are centered on the oil seal sleeve. Use special tool T-21578-4 to locate the oil seal carrier.

Output Shaft Cylindrical Roller Bearing Inner Race



19-1-018

Figure 104. Output Shaft Bearing Inner Race (4) Installation

1. Heat the bearing inner race (4) to 120°C (250°F).

⚠ WARNING

Handle the bearing inner race with care. The race is HOT.

2. Rotate bearing inner race to ensure it is fully seated against the oil seal sleeve.

Bearing Spacer

1. Heat the output shaft bearing spacer to 120°C (250°F).

⚠ WARNING

Handle the output shaft bearing spacer with care. The spacer is HOT.

2. Ensure the spacer is fully seated against the bearing inner race.

19-1-17

Figure 105. Output Shaft with Seal Carrier

3. Set output shaft subassembly aside until further assembly is required.

Trailing Pump Drive Assembly

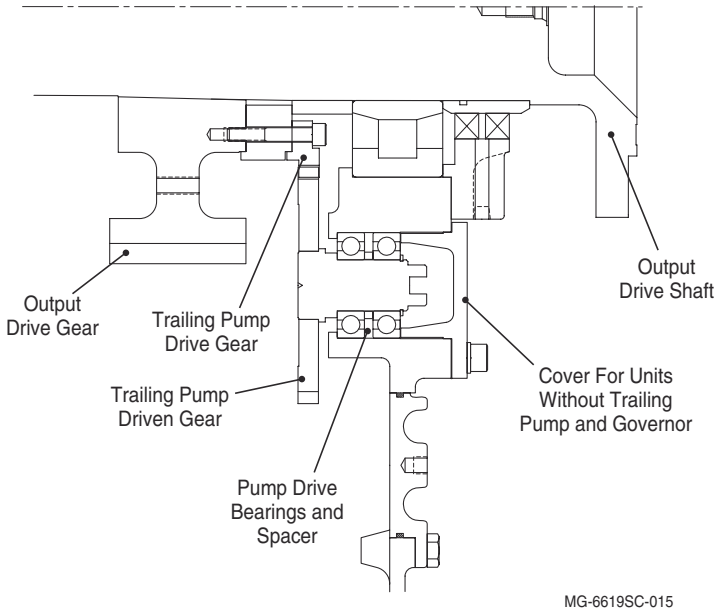
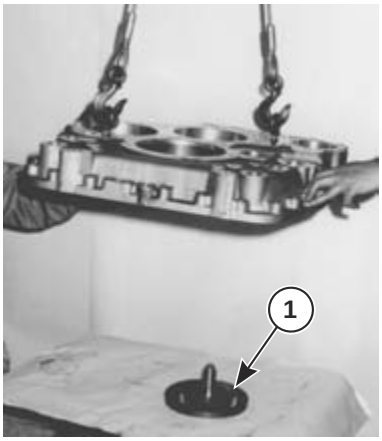


Figure 106. Trailing Pump Drive Component Identification and Location

1. Apply a thin film of grease to the bearing bore for the trailing pump drive gear.

2. Place the trailing pump drive gear (1) below its bearing bore under the rear housing. Support the trailing pump drive gear so that shaft sholder is even with the shoulder in the rear housing.



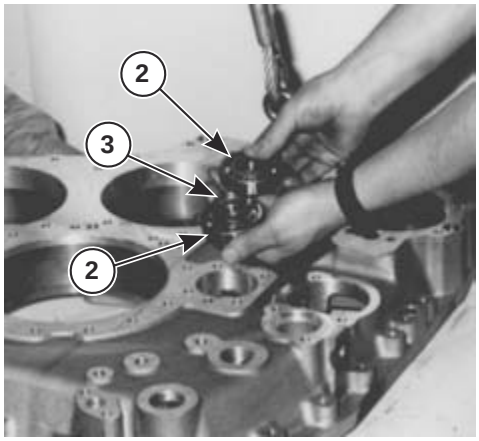
19-1-014

Figure 107. Trailing Pump Drive Gear (1) Placement

3. Place one of the ball bearings (2) over the trailing pump shaft and drive until seated. Use special tool T-21482-45.

4. Install the spacer (3) over the shaft.

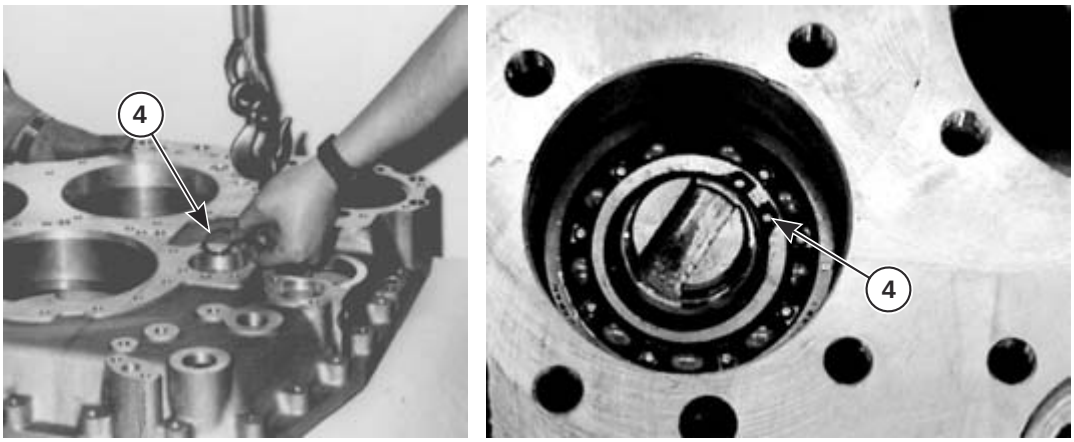
5. Install the second ball bearing (2) over the trailing pump shaft and drive until seated. Use special tool T-21482-45



19-1-013

Figure 108. Trailing Pump Ball Bearings (2) and Spacer (3) Installation

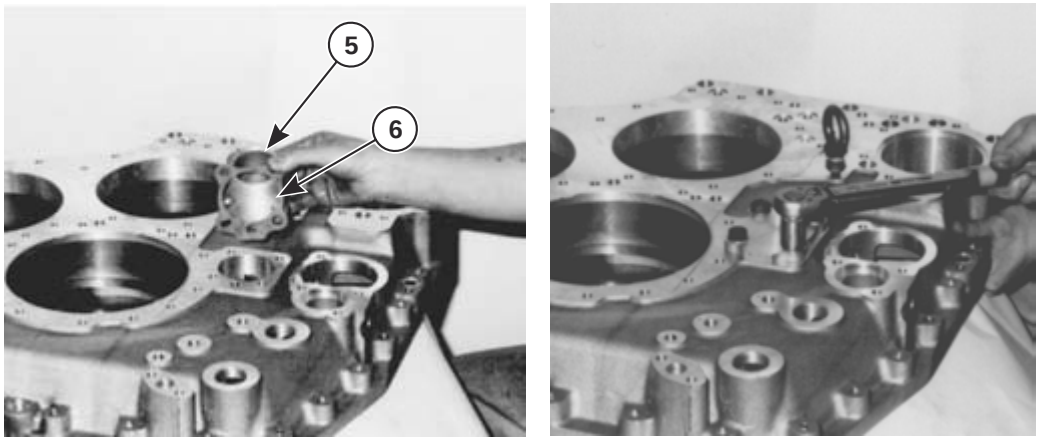
6. Install the external retaining ring (4) over the shaft end to retain the ball bearings.



19-1-012 AAR204E-6557

Figure 109. Trailing Pump Retaining Ring (4) Installation

7. Install the trailing pump cover (5) or pump, if equipped, and gasket (6). Torque the attaching screws to 56 N•m (41 lb•ft).

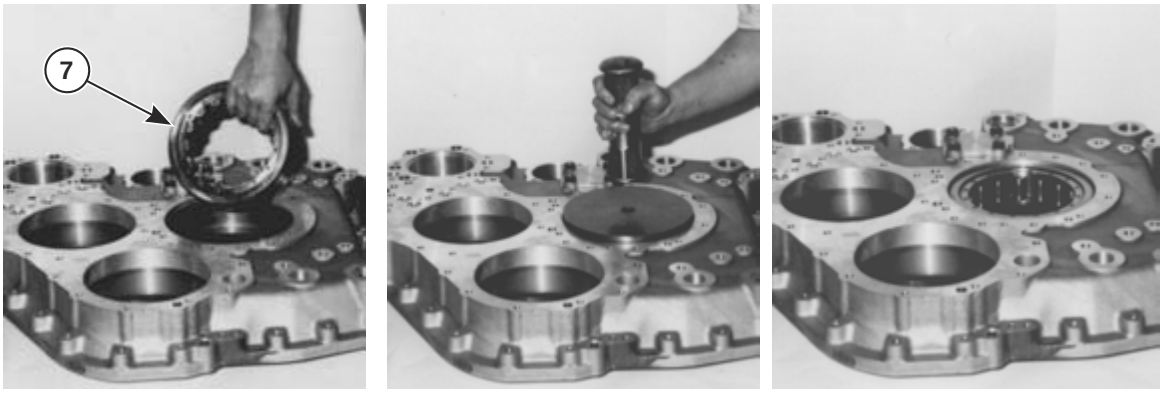


19-1-011 19-1-009

Figure 110. Trailing Pump Cover (5) and Gasket (6) Installation

Rear Housing Assembly

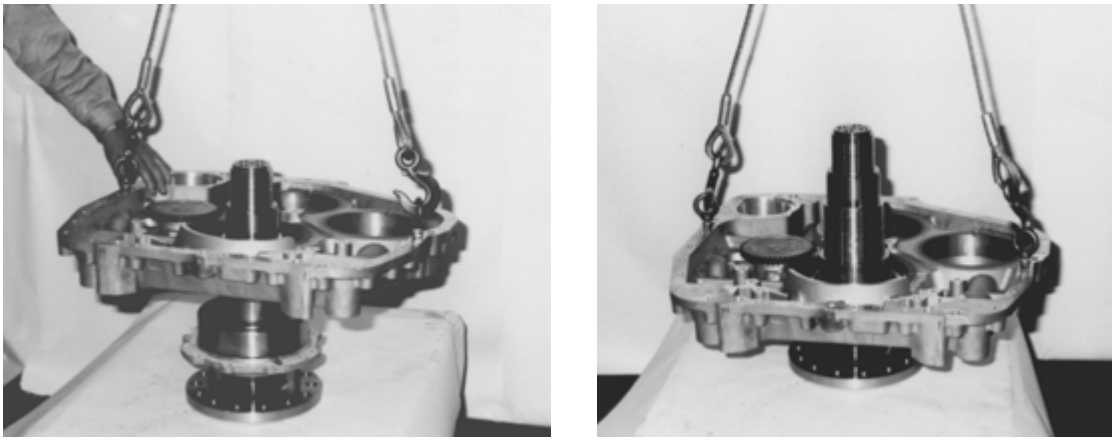
1. Apply a thin film of grease to the output beaing bore. Install the rear cylindrical roller bearing (7) into the rear housing.



19-1-008 19-1-006 19-1-007

Figure 111. Rear Cylindrical Roller Bearing (7) Installation

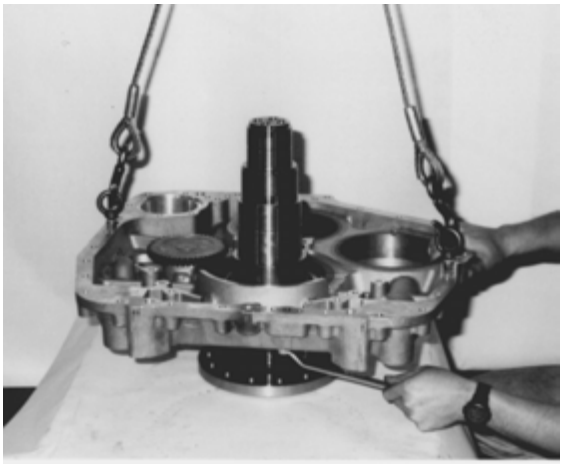
2. Install retainers at primary and secondary shaft location to prevent bearing races from falling out when they are installed later. Install four support legs, T-21482-39 to support the housing when it is inverted. It may be necessary to use spacers to level the housing.
3. Install short guide studs (M10) into housing to ease the alignment of the output seal carrier.
4. Apply M1015 sealer to the output oil seal carrier where it contacts the rear housing.
5. Invert the rear housing and lower it over the output shaft assembly. Insert guide studs into the holes in the output seal carrier.



19-1-005 19-1-004

Figure 112. Lower Rear Housing over Output Shaft Assembly

6. Install the attaching fasteners and torque them to 56 N•m (41 lb•ft).

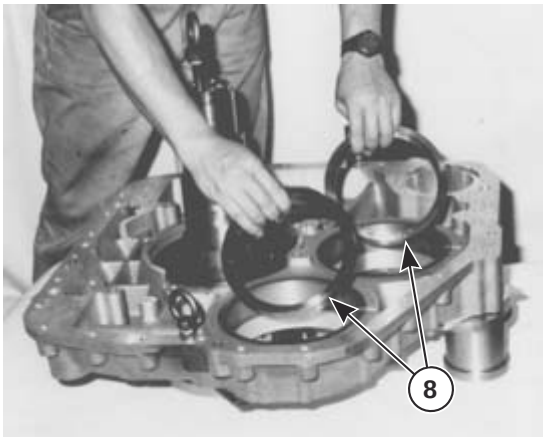


19-1-002

Figure 113. Rear Housing Fastener Attachment

7. Securely support housing assembly with blocks. Verify that there is at least 100 mm (4 inches) of clearance below the primary and secondary shaft bearing bores, as the shafts will protrude through the rear housing.

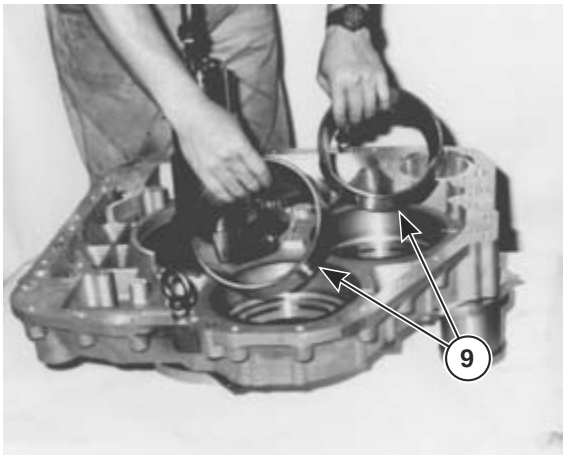
8. Apply a thin film of grease to the bearing bores of the rear housing. Install the bearing spacers (8) into their respective bores.

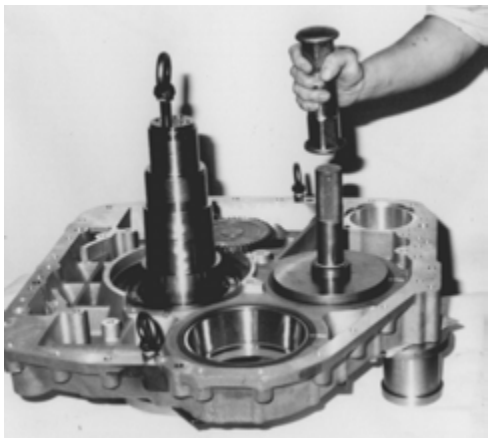


19-2-035

Figure 114. Rear Bearing Spacers (8) Installation

9. Install the rear tapered roller bearing cups (9) into the bearing bores and drive until seated against the retainers with a tubular driver.

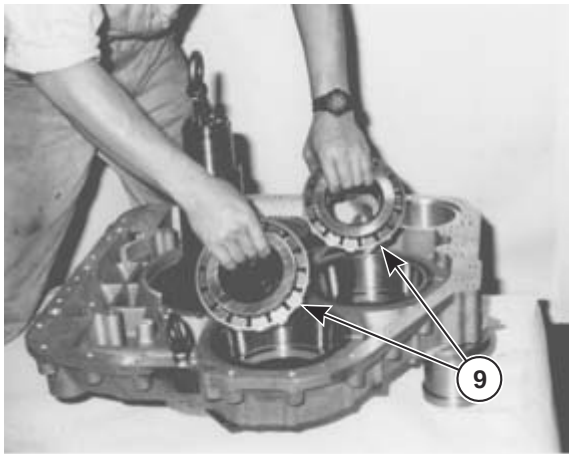


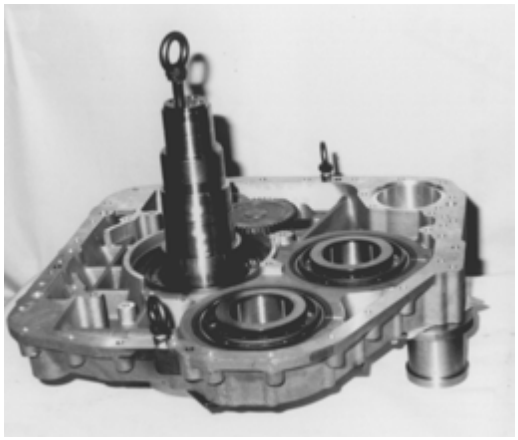


19-2-034 19-2-032

Figure 115. Rear Tapered Roller Bearing Cups (9) Installation

10. Set the tapered roller bearing cones (10) into the bearing cups.

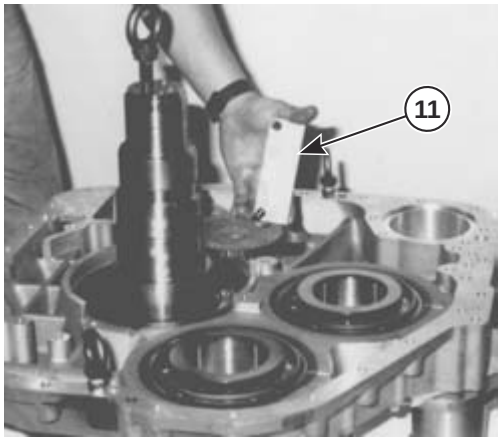




19-2-031 19-2-030

Figure 116. Rear Tapered Roller Bearing Cones (10) Installation

11. Install the oil catch baffle (11) and torque the two attaching screws to 43 N•m (32 lb•ft).



19-2-029

Figure 117. Oil Catch Baffle (11) Installation

Output Gear

Note: There are two methods of retaining the trailing gear to the output gear.

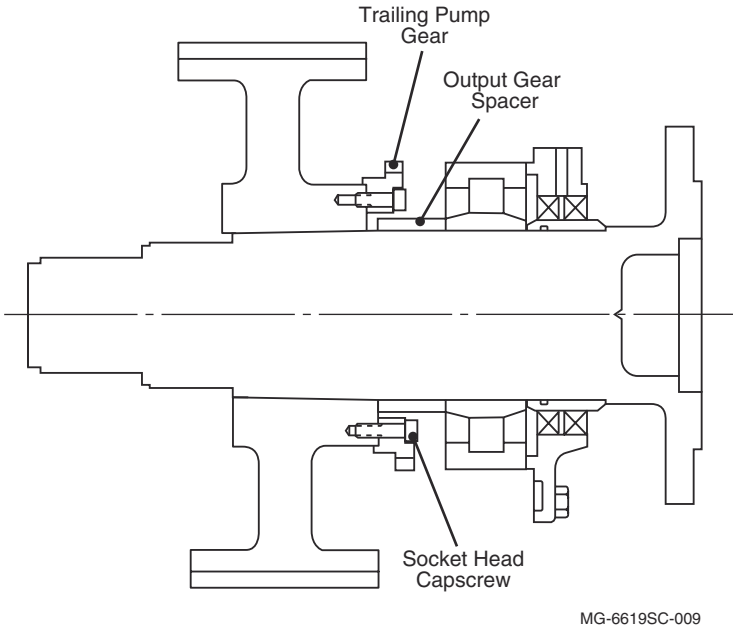


Figure 118. Trailing Pump Gear Retained by Socket Head Capscrews

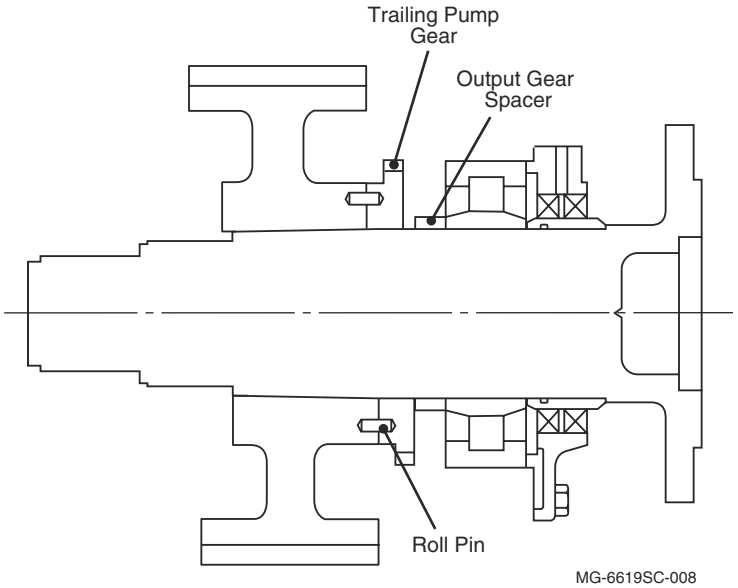


Figure 119. Trailing Pump Gear Retained by Roll Pins

Assemble Output Gear - Trailing Pump Gear Retained by Socket Head Capscrews

⚠ CAUTION

If the output gear is damaged and cannot be repaired without material removal, replace the output gear.

1. Clean and inspect the output gear tapered bore. Prepare the gear tapered bore surface for assembly by using a Scotchbrite® pad to remove any burrs.

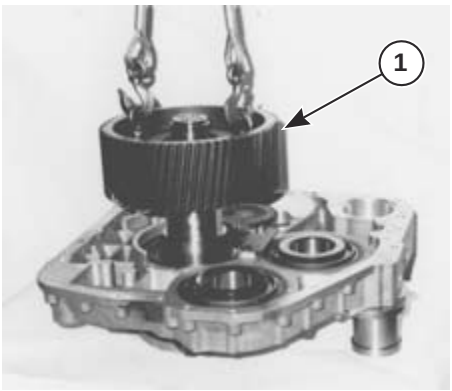
2. Install the trailing pump gear, if it was removed from the output gear. Apply MA908 (Locktite® 242) to the threads of the four capscrews. Torque the capscrews to 27.4 N•m (20.3 lb•ft).

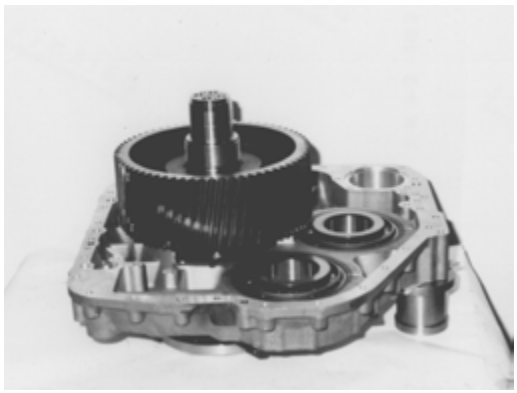
3. Clean the output shaft tapered surface and the output gear bore with solvent. Dry the output shaft and clear all oil passages in the shaft with compressed air.

⚠ CAUTION

The tapered surface of the output shaft and output gear bore must be completely free of grease, oil dirt or solvent residue. Failure to properly clean the mating surfaces could prevent advance of the output gear on the output shaft and adversely affect the torque carrying capacity of the assembled joint.

4. Ensure the output gear bore is clean and free of grease and other contaminants. Install two M10-1.5 eyebolts into the output gear (1) and lower it on the output shaft with the trailing pump gear toward the rear housing. Seat the output gear onto the output shaft by tapping with a deadblow hammer.





19-2-027 19-2-026

Figure 120. Lower Output Gear (1) onto Output Shaft Assembly

5. Measure the expected gear advance. The expected gear advance is indicated in the table on the reference drawing.

PROCESS OF DETERMINING GEAR ADVANCE:

1. Put the gear on the output shaft, and strike it lightly.
2. Measure D and check advance is within table.

TABLE: EXPECTED ADVANCE (D)

GEAR RATIO	ACTUAL ADVANCE
1.06	3.04-4.96
1.33	4.04-5.96
1.53	5.04-6.96
1.73	5.04-6.96
2.03	6.64-8.56
2.44	6.64-8.56
2.72	6.64-8.56
2.93	6.64-8.56

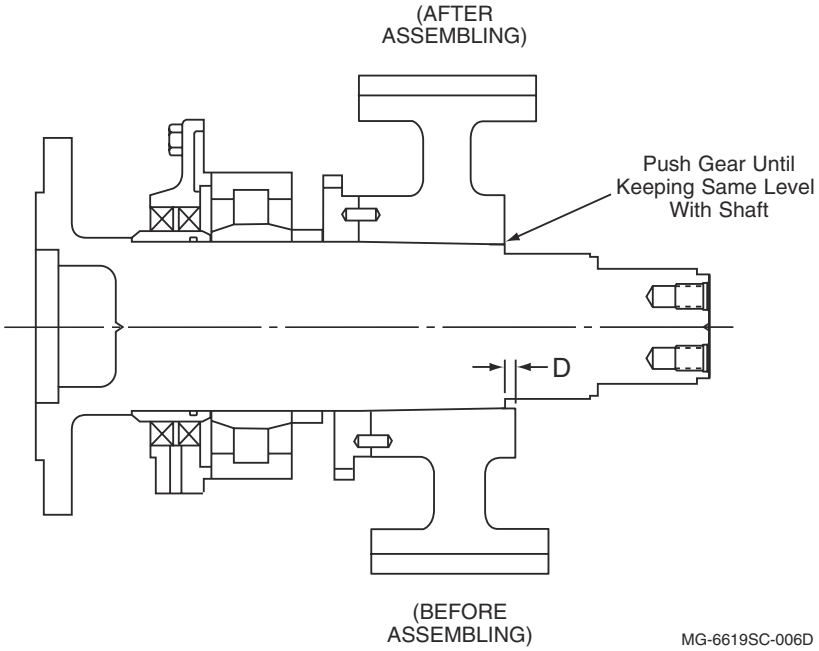


Figure 121. Output Shaft Advancement Procedure

a. Measure from the shoulder of the output shaft to the face of the output gear. Measure in three locations around the circumference of the shaft. The three readings should be identical. Record the distance as Dimension A (reference drawing).

Dimension A = _____

b. Measure from the shoulder of the output shaft to the step on the output shaft. Measure in three locations around the circumference of the shaft. The three readings should be identical. Record the distance as Dimension B (reference drawing).

Dimension B = _____

c. Determine the expected gear advance. Subtract Dimension B from Dimension A. Record the distance as Dimension C (reference drawing).

Dimension C = _____

d. Check the expected gear advance Dimension C against table on the reference drawing.

⚠ CAUTION

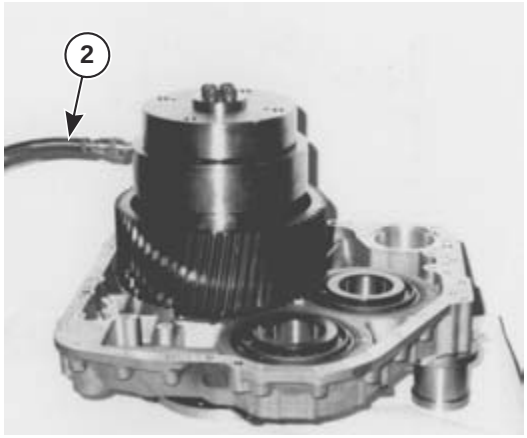
If the calcuated advance falls outside the range given in the table, check to ensure all measurements/calculations are correct. If errors are found, it will be necessary to change parts. Contact the Product Service Department of Twin Disc, Incorporated.

6. If the expected gear advance falls within the range in the table, continue to install the output gear onto the output shaft. Install special tool T-21482-01, ram base onto the output shaft.

7. Install T-21482-2 hydraulic ram over T-21482-02 ram support, and place this assembly over shaft against the ram base.

8. Install the output bearing carrier into special tool T-21482-02, ram support. Torque the attaching screws to 236 N•m (174 lb•ft).

9. Connect the pressure source (2) to T-21482-2 hydraulic ram and apply 510 kgf/cm2 (7,250 PSI). Hold the pressure momentarily.

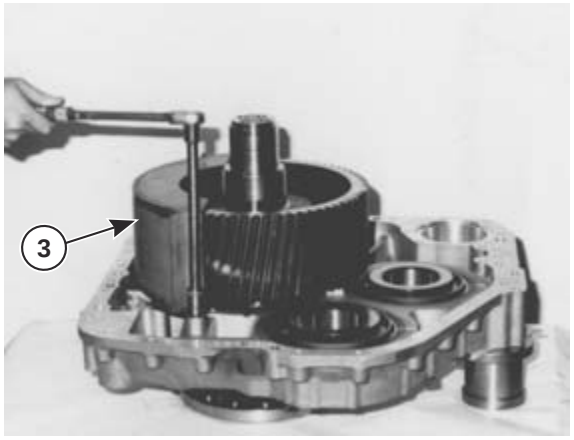


19-2-024

Figure 122. Output Bearing Carrier Installation and Power Source Connection

10. Release the oil pressure and remove the bearing carrier and the special tools, and confirm proper advance.

11. Install the output gear pan (3). Torque the attaching screws to 43 N•m (32 lb•ft).



19-2-023

Figure 123. Output Gear Pan (3) Installation

Assemble Output Gear - Trailing Pump Gear Retained by Pins

⚠ CAUTION

If the output gear is damaged and cannot be repaired without material removal, replace the output gear.

1. Clean and inspect the output gear tapered bore. Prepare the gear tapered bore surface for assembly by using a Scotchbrite® pad to remove any burrs.

2. Install the trailing pump gear if it was removed from the output gear.

3. Clean the output shaft tapered surface and the output gear bore with solvent. Dry the output shaft and clear all oil passages in the shaft with compressed air.

⚠ CAUTION

The tapered surface of the output shaft and output gear bore must be completely free of grease, oil dirt or solvent residue. Failure to properly clean the mating surfaces could prevent advance of the output gear on the output shaft and adversely affect the torque carrying capacity of the assembled joint.

4. Calculate for the correct shim pack as follows:

PROCESS OF CALCULATING SHIM PACK:

1. Remove oil on the taper location. (Output shaft and gear)
2. Measure A and B.
3. Thickness of the C shims is obtained in according to following formula.
   C=A-B+(0~0.1mm)

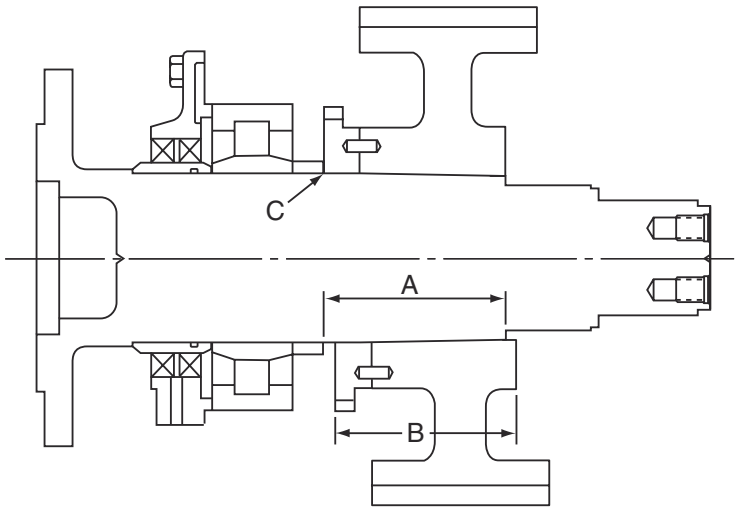


Figure 124. Calculate Shim Pack

a. Measure from the shaft shoulder to the front edge of the spacer located next to the spherical roller bearing. Measure in three locations around the circumference of the shaft. The three readings should be identical. Record this distance as Dimension A (reference drawing).

Dimension A = _____

b. Place the output gear on a flat uniform surface such as a layout table. Measure from the edge of the output gear to the surface of the layout table. Place output gear on table with trailing pump gear against the table. Measure in three locations around the circumference of the output gear bore. The three readings should be identical. Record this distance as Dimension B (reference drawing).

Dimension B = _____

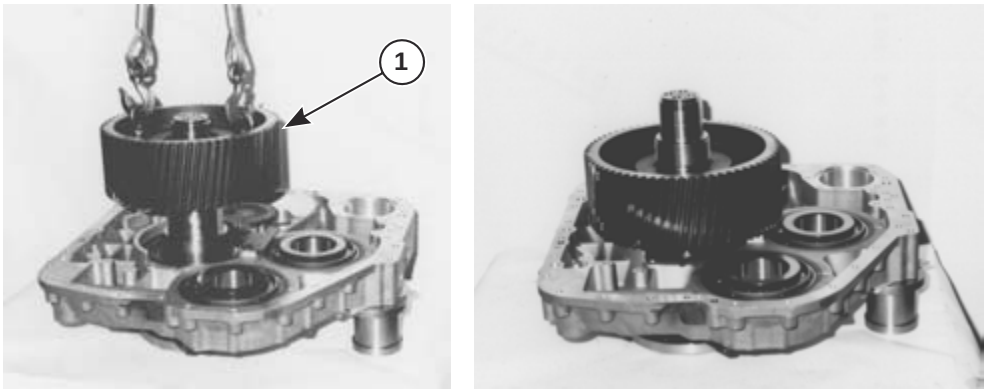
c. Calculate the correct shim pack (reference drawing dimension C) required to set the output gear advance on the output shaft as follows:

Calculate the shims:
Dimension (A) - (Dimension B) + (0.00 - 0.1 mm) = Shims (Dimension C)

Dimension (A) - (Dimension B) + (0.00 - 0.004 in.) = Shims (Dimension C)

d. Install the calculated shim pack (C) next to the spacer.

5. Ensure the output gear bore is clean and free of grease and other contaminants. Install two M10-1.5 eyebolts into the output gear (1) and lower it on the output shaft with the trailing pump gear toward the rear housing. Seat the output gear onto the output shaft by tapping it with a deadblow hammer.



19-2-027 19-2-026

Figure 125. Lower Output Gear (1) onto Output Shaft Assembly

6. Measure the expected gear advance. The expected gear advance is indicated in table on reference drawing. Measure from the face of the output gear to the step on the output shaft.

PROCESS OF DETERMINING GEAR ADVANCE:

1. Put the gear on the output shaft, and strike it lightly.
2. Measure D and check advance is within table.

TABLE: EXPECTED ADVANCE (D)

GEAR RATIO	ACTUAL ADVANCE
1.06	3.04-4.96
1.33	4.04-5.96
1.53	5.04-6.96
1.73	5.04-6.96
2.03	6.64-8.56
2.44	6.64-8.56
2.72	6.64-8.56
2.93	6.64-8.56

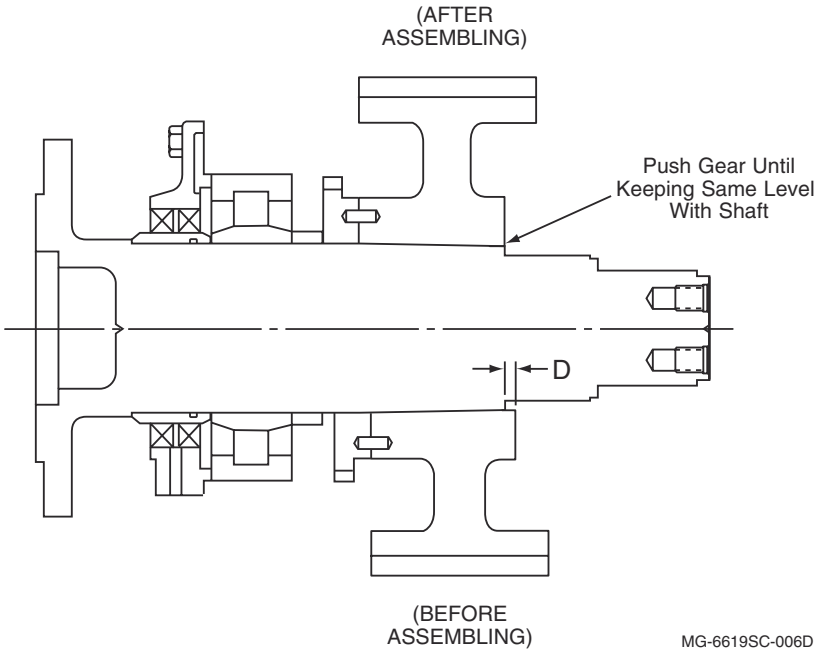


Figure 126. Determine Output Gear Advance

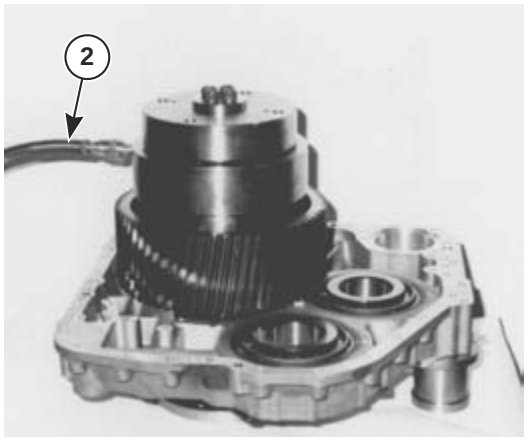
⚠ CAUTION

If the calculated advance falls outside the range given above, check to ensure all measurements/calculations are correct. If no errors are found it will be necessary to change parts. Contact the Product Service Department of Twin Disc, Incorporated.

7. If the expected gear advance falls within the range in the table, continue to install the output gear onto the output shaft. Install special tool T-21482-01, ram base, onto the output shaft.

8. Install T-21482-2 hydraulic ram over T-21482-02 ram support, and place this assembly over shaft against the ram base.
9. Install the output bearing carrier into special tool T-21482-02, ram support. Torque the attaching screws to 236 N•m (174 lb•ft).

10. Connect the pressure source (2) to T-21482-2 and apply 510 kgf/cm2 (7,250 PSI). Hold the pressure momentarily.

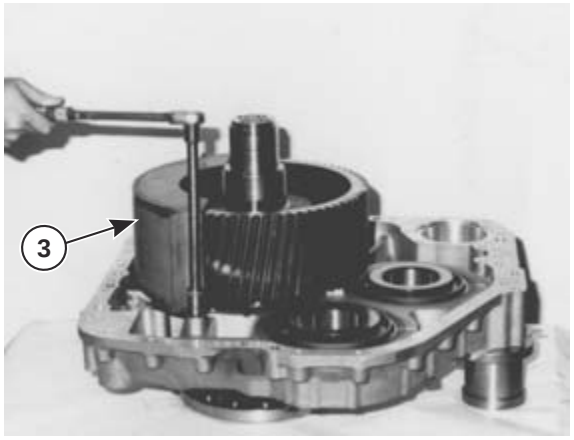


19-2-024

Figure 127. Output Bearing Carrier Installation and Power Source Connection

11. Release the oil pressure and remove the bearing carrier and special tools, and confirm proper advance.

12. Install the output gear pan (3). Torque the attaching screws to 43 N•m (32 lb•ft).



19-2-023

Figure 128. Output Gear Pan (3) Installation

Primary and Secondary Clutch Shaft Sub-Assemblies

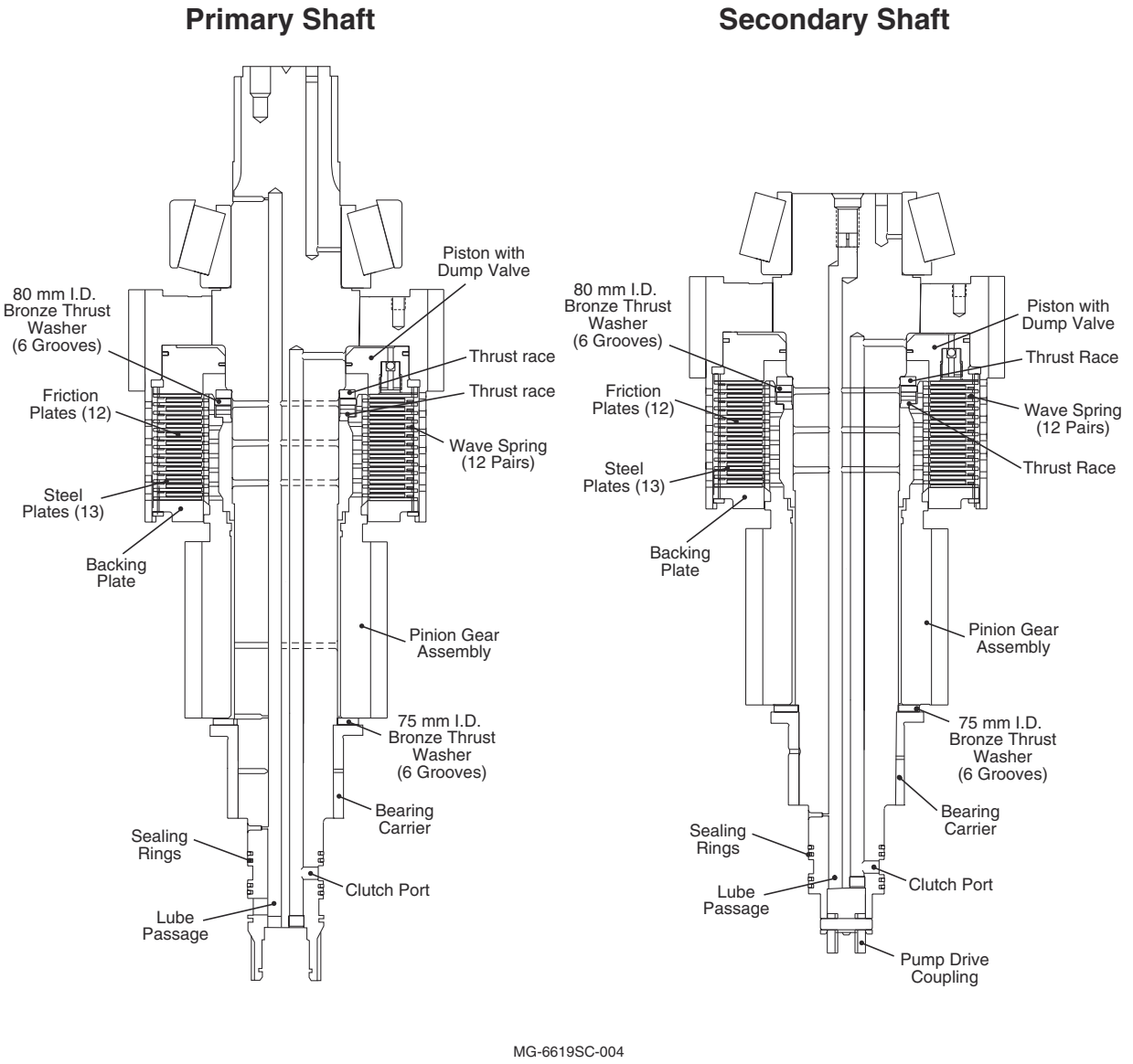
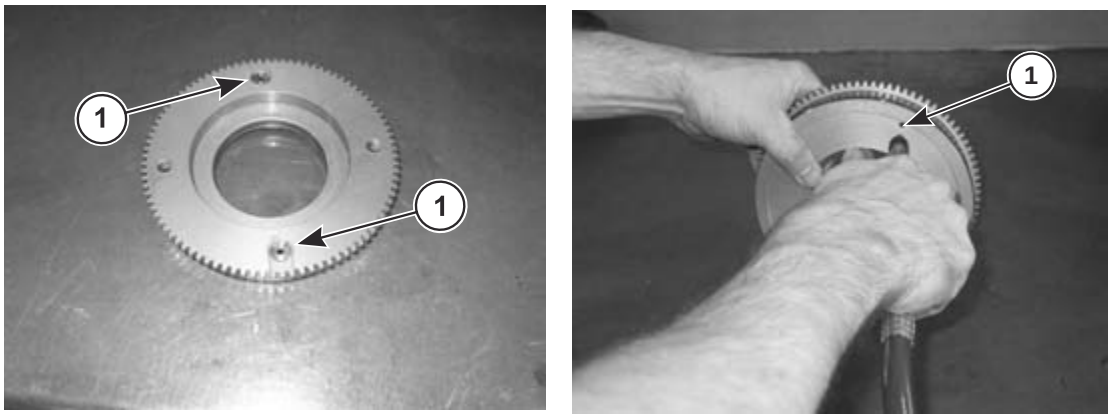


Figure 129. Primary and Secondary Clutch Shaft Component Identification and Location

Note: The following instructions pertain to both the primary and secondary clutch assemblies.

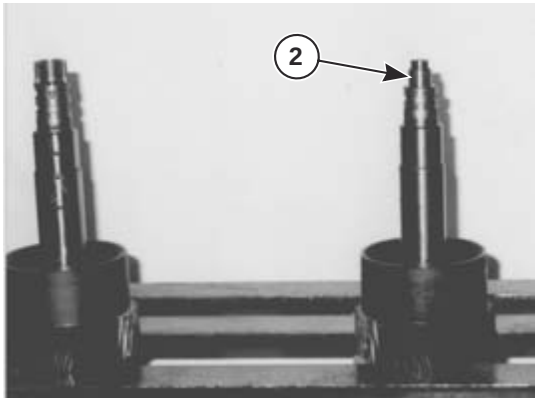
1. Inspect the clutch piston dump valves (1) for proper operation. Be sure the dump valves are free to move. The clutch piston dump valves are not serviced separately.



AR6557-1023 AR6557-1021

Figure 130. Clutch Piston with Dump Valves (1)

2. Install the pump drive coupling (2) into the rear end of the secondary shaft if removed. Place the coupling in the end of the shaft and press the retaining pin through the components. When the retaining pin is flush with the shaft, stake it in two locations at both ends of the pin.



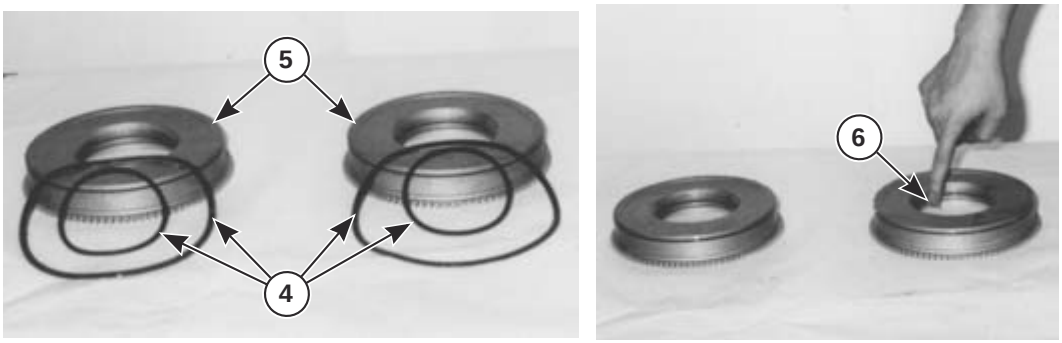
19-3-012

Figure 131. Pump Drive Coupling (2) Installation

3. Apply a thin film of grease to the clutch piston bore and the shaft diameter where the clutch piston sealing rings will contact.

4. Replace the clutch pistion seals. Install two new piston seals (4) onto each of the clutch pistons (5).

5. Apply grease to all piston seals (6) once they are on the pistons.



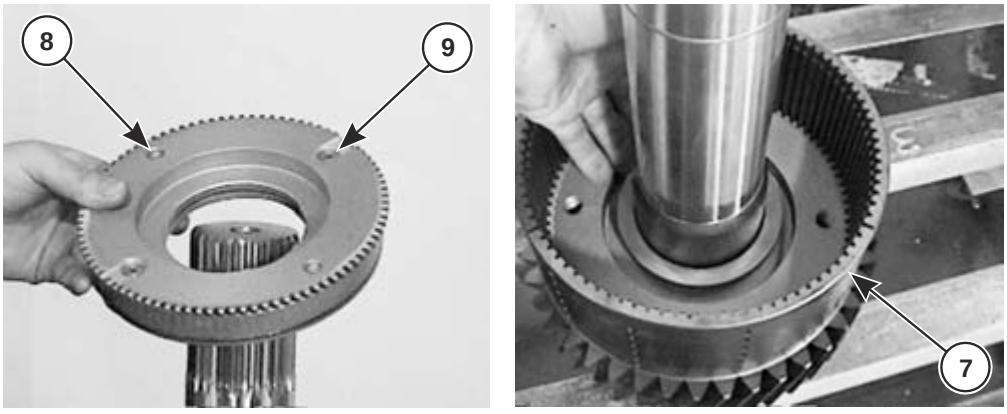
19-3-015 19-3016

Figure 132. Piston Seals (5) and Clutch Pistons (6)

6. Lubricate the clutch piston bore with a thin film of grease. Install the piston into the clutch housing. The piston contains two threaded holes (M12-1.75) in which screws can be inserted to aid in assembly. Gently push the piston by hand until it is fully engaged into the clutch (7).

Note: The piston contains two (M12-1.75) threaded holes (8) into which screws can be inserted to aid in assembly. The piston is also equipped with two dump valves (9).

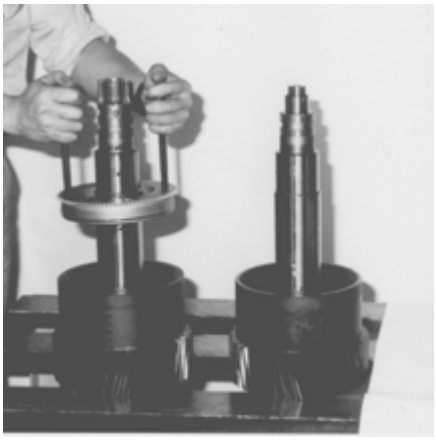
Note: If the piston is difficult to install by hand, remove the piston assembly and inspect the piston seals.

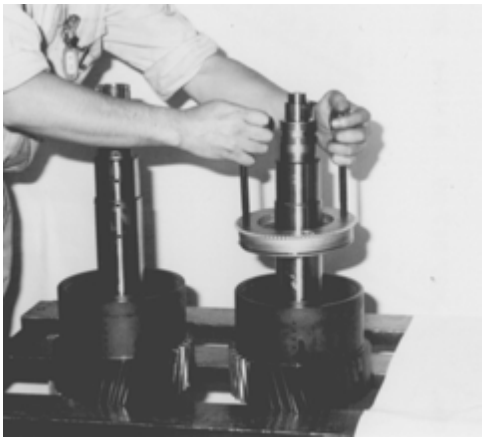


AAR188E-6557 AAR191-6557

Figure 133. Clutch Piston Installation

7. Install the clutch pistons by pushing on the eyebolts by hand.

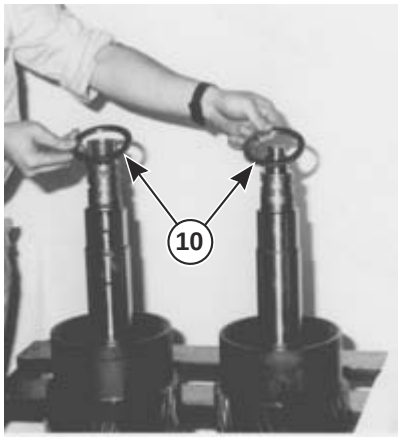


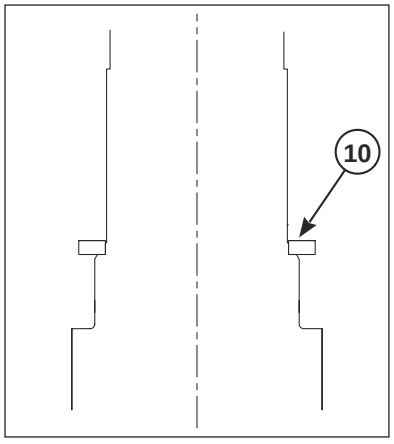


19-3-018 19-3-020

Figure 134. Clutch Piston Installation

8. Install the steel thrust washer spacer (10) that pilots on the shaft.

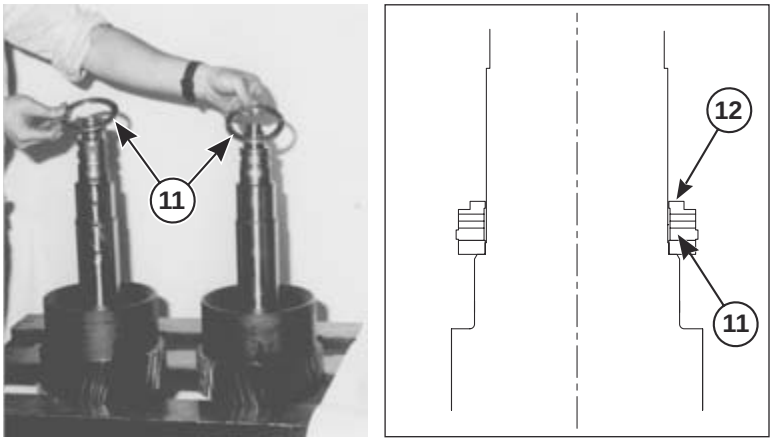




19-3-025 MG-6619A-017

Figure 135. Steel Thrust Washer Spacer (10) Installation

9. Install the inner 80 mm I.D. bronze thrust washer (11) (with six radial grooves) onto the shafts.

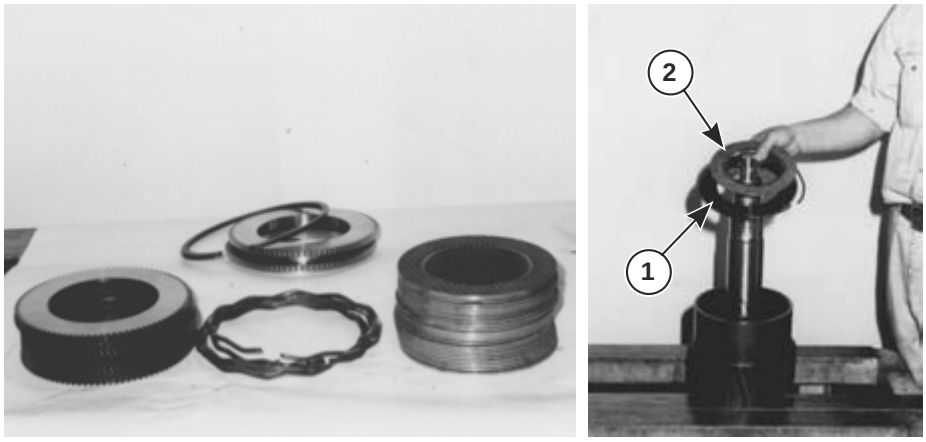


19-3-026 MG-6619A-018

Figure 136. Bronze Thrust Washer (11) Installation

10. Install one steel plate (1) next to the clutch piston.

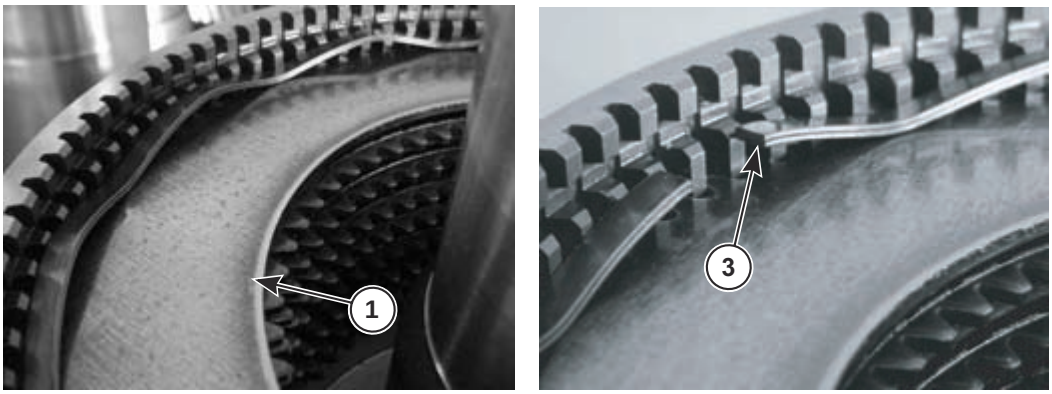
11. Install one friction plate (2) next to the steel plate.



19-3-023 2137-015

Figure 137. Steel Plate (1) and Friction Plate (2) Installation

12. Install a pair of wave springs (3) around the outer circumference of each friction plate. Each pair of wave springs is installed with the ends aligned. The wave springs are installed with their ends oriented in a random manner.



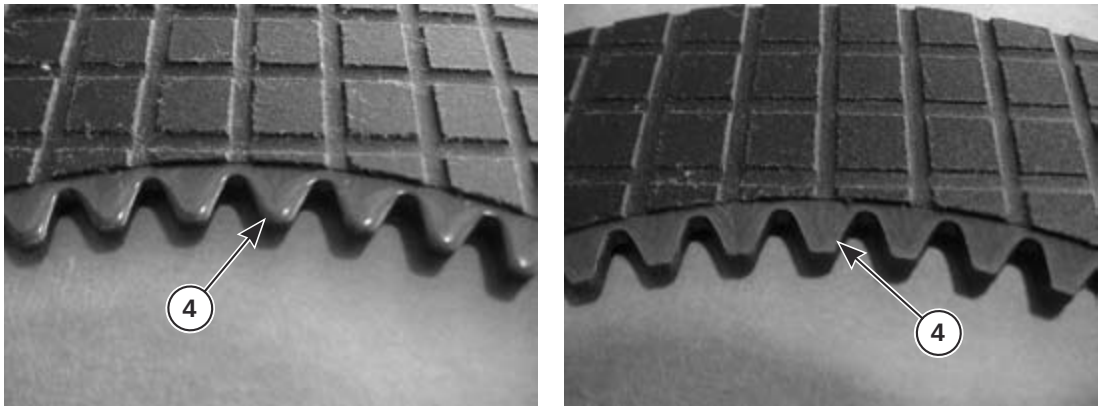
RMVC026FGS RNVC028FGS

Figure 138. Wave Spring (3) Installation

13. Install the remaining clutch plates and wave springs in an alternating fashion until all clutch plates have been installed (13 steel plates, 12 friction plates, and 12 pairs of wave springs).

Note: A steel plate is located next to the piston and the clutch backing plate.

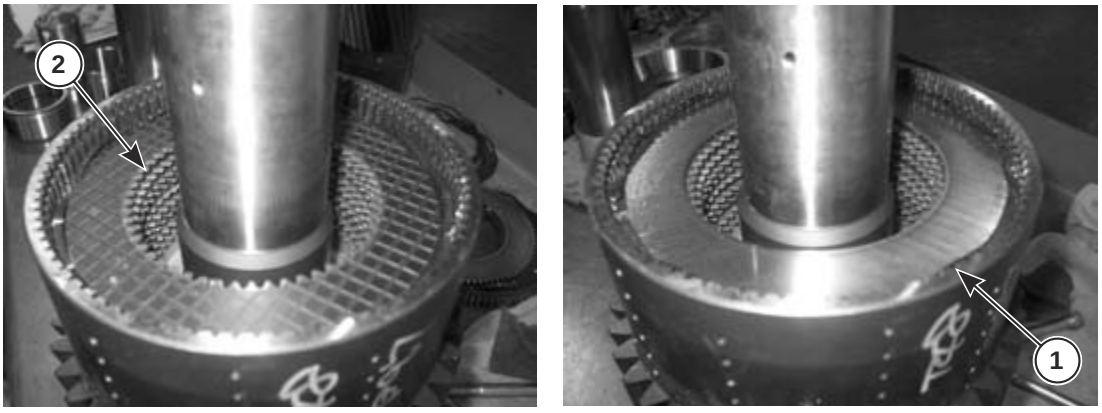
Installation Note:
Friction Plates: When installing clutch friction plates, install the plate with the rounded edge (4) away from the piston. The rounded edge makes installation of the pinion gear splines easier to align as the pinion gear is installed into the transfer gear.



AARMVC-029F AARMVC-001F

Figure 139. Clutch Friction Plate Edge (4), Rounded Edge and Sharp Edge Shown

Steel Plates: When installing steel clutch plates (1), install the plate with the rounded edge toward the piston. The rounded edge is easier to install into the transfer gear splines when installed in this manner.

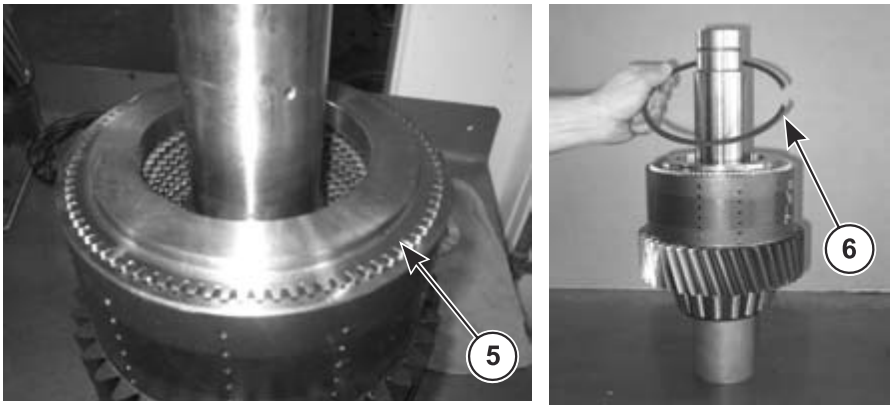


AAR6557-067 AAR6557-068

Figure 140. Clutch Friction Plate (2) and Steel Plate (1) Installation

14. Install the clutch backing plate (5) over the top steel plate. Push by hand to ensure the splines are aligned.

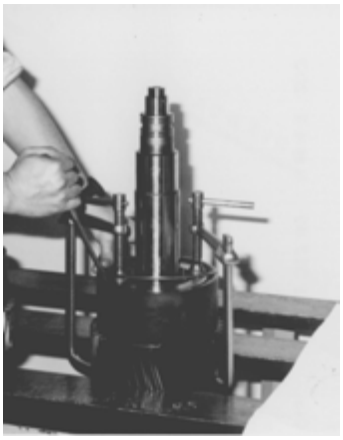
15. Place the internal retaining ring (6) over the clutch backing plate.



AAR6557-069 AAR187-6557

Figure 141. Clutch Backing Plate (5) and Retaining Ring (6) Installation

16. Install two clamps on the clutch housing and backing plate. Use the clamps to evenly compress the clutch until the retaining ring can be installed properly into the clutch housing. After the retaining ring is installed, remove the clamps.

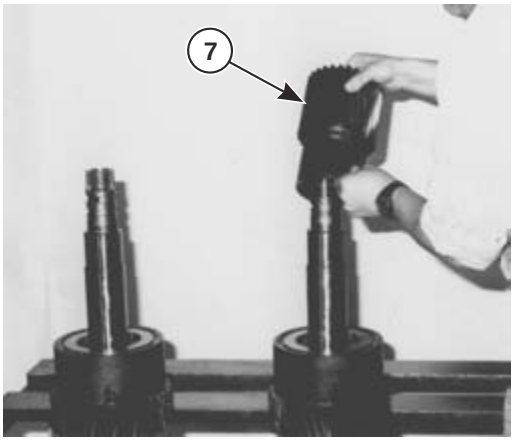


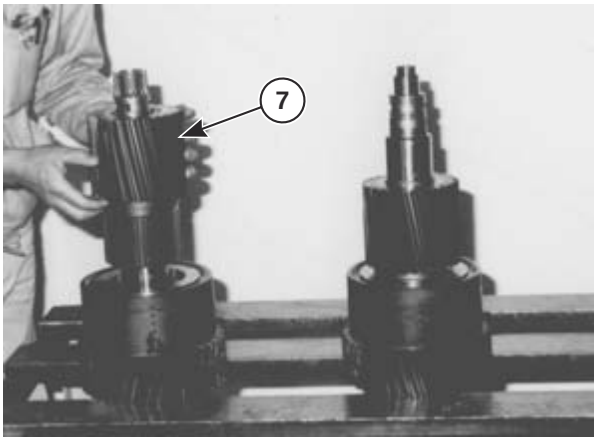
19-3-031 19-3-027

Figure 142. Retaining Ring Installation

17. Install the pinion gear assembly (7) into the clutch plates.

    a. Apply a thin film of grease to each of the shafts that will contact the pinion gear.
    b. Gently rotate the pinion as it is lowered to ensure the splines are fully engaged in all of the clutch plates.

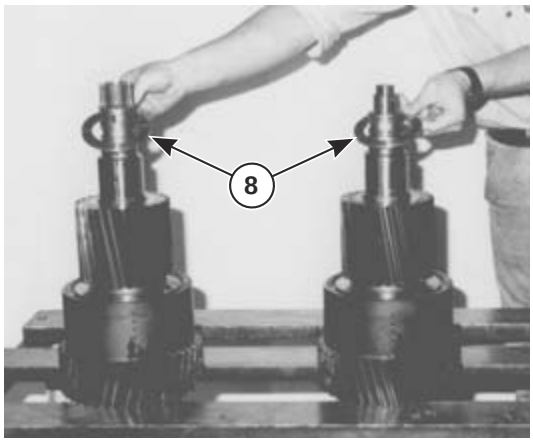




19-3-034 19-3-006

Figure 143. Pinion Gear Assembly (7) Installation

18. Install the rear 75 mm I.D. bronze thrust washer (8) (with six radial grooves) next to the pinion gear assembly.



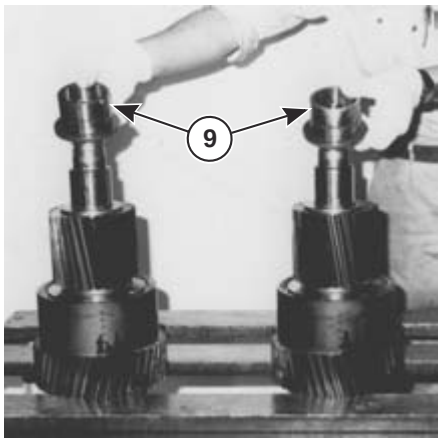
19-3-005

Figure 144. Bronze Thrust Washer (8) Installation

19. Heat the primary and secondary clutch shaft rear bearing carriers (9) to a temperature of 120°C (250°F). Install rear bearing carrier next to bronze thrust washer (8). Push it firmly into position against the clutch shaft shoulder as it cools.

⚠ WARNING

Handle the bearing carrier with care. The bearing carrier is HOT.



19-3-003

Figure 145. Bearing Carrier (9) Installation

Note: The bearing carrier (9) should contact the shaft (stop shoulder) as it is installed. To verify the bearing carrier is positioned correctly, the end of the bearing carrier should be flush with the shoulder of the shaft. Place a straight edge across the top of the shaft and bearing carrier. If all components are installed correctly, no air gap should be observed between the straight edge and the shoulder of the shaft.

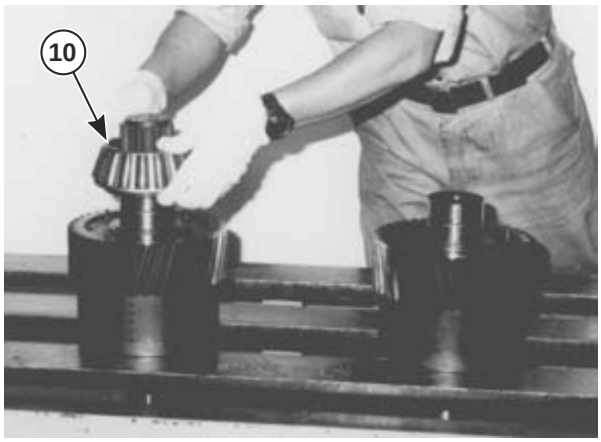
20. Invert the clutch shaft assemblies (sealing ring ends of the shafts will now be at the bottom).

21. Install the front tapered roller bearing (10) onto each of the shafts.

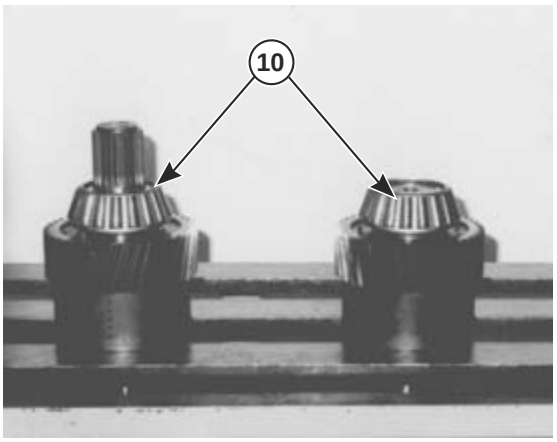
    a. Heat front tapered roller bearing to 120°C (250°F).

⚠ WARNING
Handle the tapered roller bearing with care. The bearing is HOT.

b. Place the front tapered roller bearing onto the shafts.
c. Push the roller bearings firmly into position against the clutch housing.



19-3-008

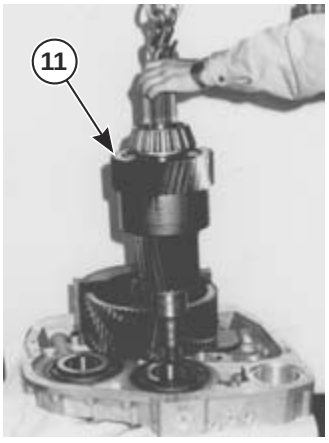


19-3-011

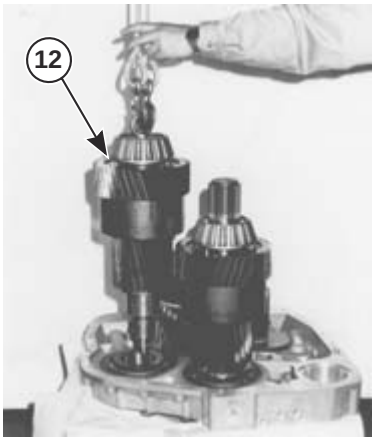
Figure 146. Front Tapered Roller Bearing (10) Installation

22. Install the primary (11) and secondary (12) clutch shaft assemblies into the rear housing with a hoist.

a. Apply a thin film of grease to the bearing carriers and the bores of the tapered roller bearing cones.
b. Thread one M14-2.0 eyebolt into the top end of the primary clutch shaft assembly.
c. Thread one M16-2.0 eyebolt into the top end of the secondary clutch shaft assembly.



19-2-022



19-2-019

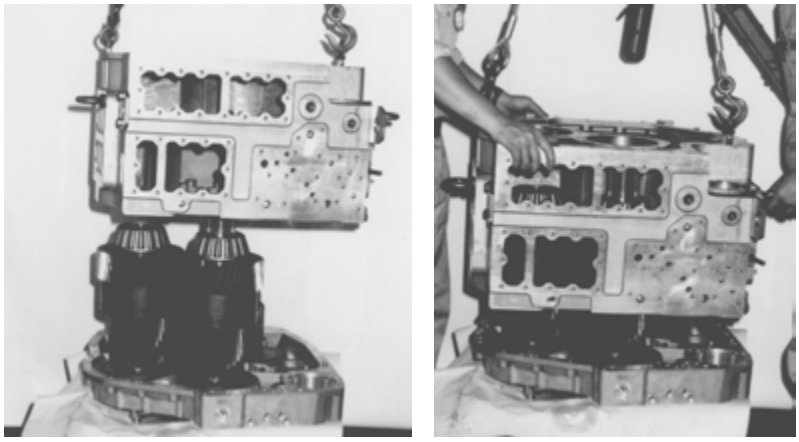
Figure 147. Installation of Primary (11) and Secondary (12) Clutch Shaft Assemblies

Main Housing Assembly

1. Install the seven (six small and one large) O-rings into the counterbores at the rear of the main housing. Use grease to hold them in place.

2. Apply M1015 sealer to the main housing where it seals to the rear housing.
3. Lower the main housing onto the rear housing.

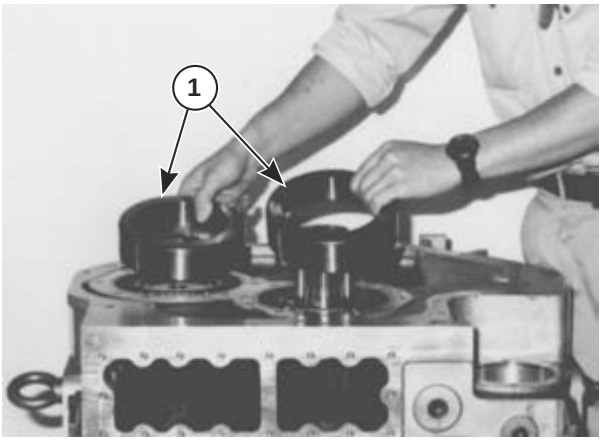
   a. Start attaching the main housing to the rear housing.
   b. Drive the three dowel pins until the ends are flush.
   c. Torque the housing screws to 45 N•m (33 lb•ft) initially.



19-2-015 19-2-014

Figure 148. Lower Main Housing onto the Rear Housing

4. Install the primary and secondary shaft bearing cups (1) into their bores. Seat the bearing cups lightly with a tubular driver.

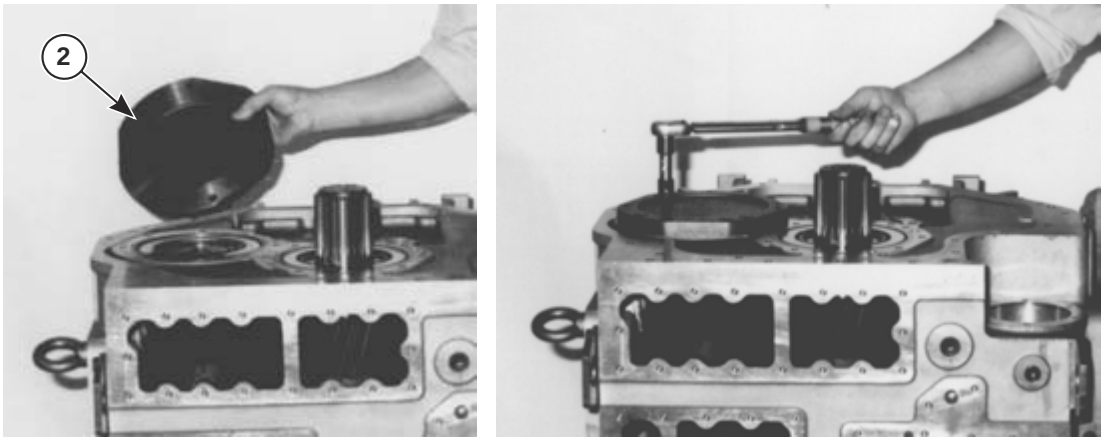


19-2-013

Figure 149. Shaft Bearing Cup (1) Installation

5. Install the secondary shaft cover (2) onto the main housing.

   a. Apply MA1015 sealer to the secondary shaft cover where it seals to the main housing.
   b. Install attaching screws and torque them to 56 N•m (41 lb•ft).

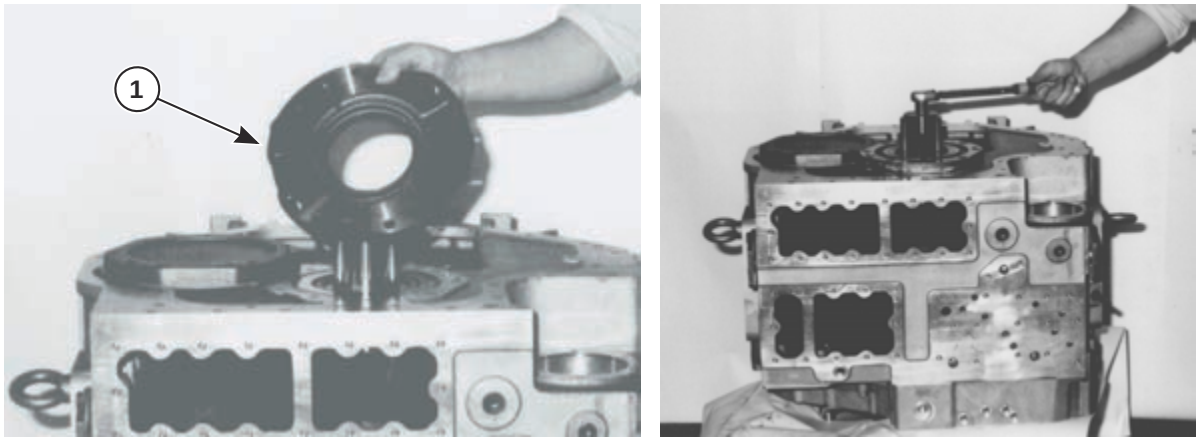


19-2-011 19-2-009

Figure 150. Secondary Shaft Cover (2) Installation

6. Install the input oil seal carrier (3) onto the main housing.

   a. Coat the outside diameter of the input oil seal with MA1015 sealer and install into the input oil seal carrier.
   b. Apply grease to the oil seal lip.
   c. Apply MA1015 sealer to the input seal carrier before installation.
   d. Tap the carrier near the dowel pins to seat it against the main housing.
   e. Torque the attaching screws to 56 N•m (41 lb•ft).

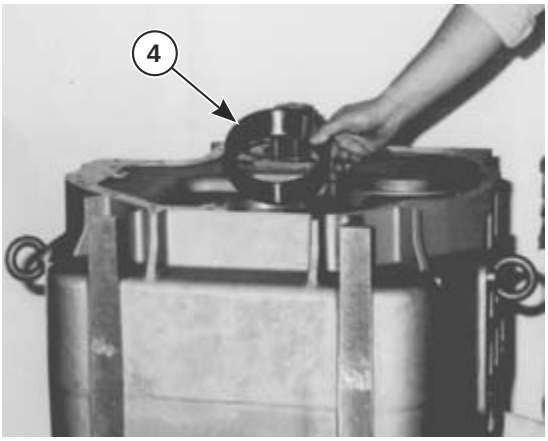


19-2-008 19-2-006

Figure 151. Input Oil Seal Carrier (3) Installation

7. Adjust the output shaft height in the transmission housing (if necessary) so the output shaft shoulder that stops the bearing cone is 5 mm (0.002 in) above the bottom of the bearing bore in the main housing.

8. Install the inner bearing cup (4) into the main housing with large diameter facing up. Drive the bearing cup until it is seated with a tubular driver.



19-2-005

Figure 152. Output Shaft Tapered Roller Bearing Cup (4) Installation

9. Heat the inner bearing cone to 120°C (250°F). Install the bearing cone with small diameter facing down.

⚠ WARNING

Handle the bearing with care. The bearing is HOT.

10. Install the spacer over the output shaft and against the bearing.

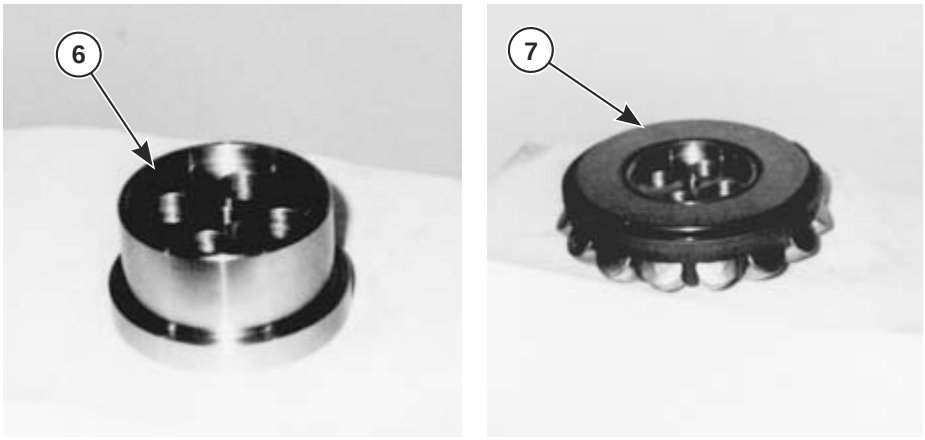
11. Assemble the bearing (6) into the bearing cone (7).

    a. Heat the bearing to 120°C (250°F).

⚠ WARNING

Handle the bearing with care. The bearing is HOT.

    b. The small diameter end of the bearing cone goes onto the bearing carrier first.
    c. Rotate the bearing cone on the bearing carrier to ensure it is fully seated.

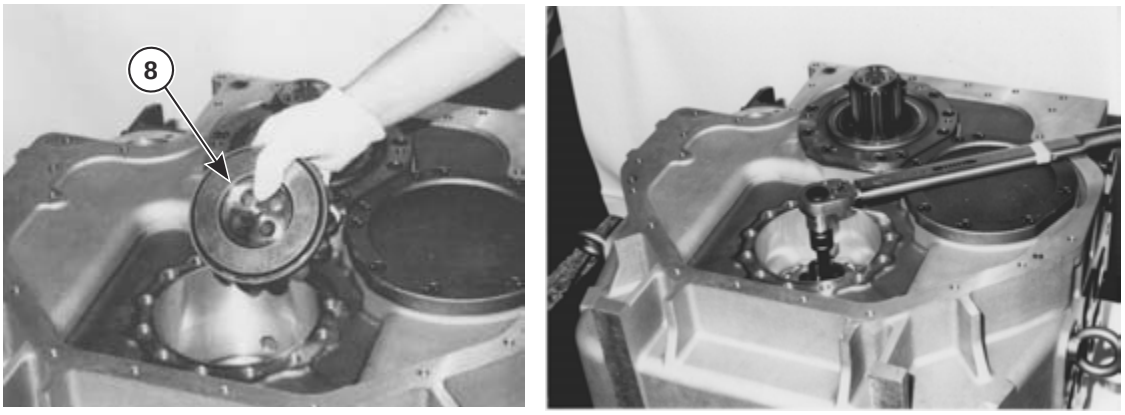


19-2-001 19-4-001

Figure 153. Install Bearing Carrier (6) into Bearing Cone (7)

12. Install the bearing carrier and cone (8) onto the output shaft.

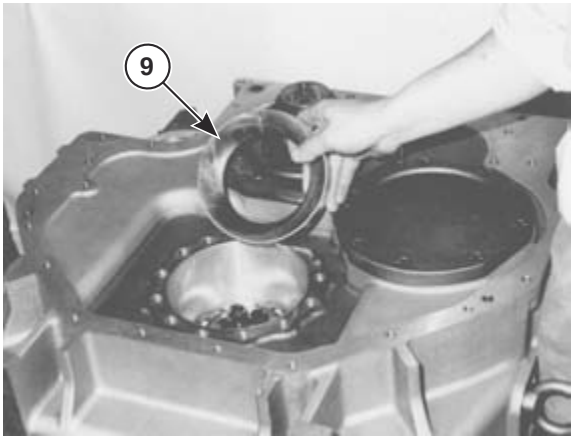
    a. Restrain the output shaft from rotation. Use special tool T-21482-37.
    b. Torque attaching screws to 235 N•m (174 lb•ft)



19-4-016 19-4-013

Figure 154. Bearing Carrier and Cone (8) Installation

13. Install the bearing cup (9) onto the output shaft. Bearing cup should have the large diameter of the bore toward rear of the transmission.



19-4-012

Figure 155. Bearing Housing Spacer (9) Installation

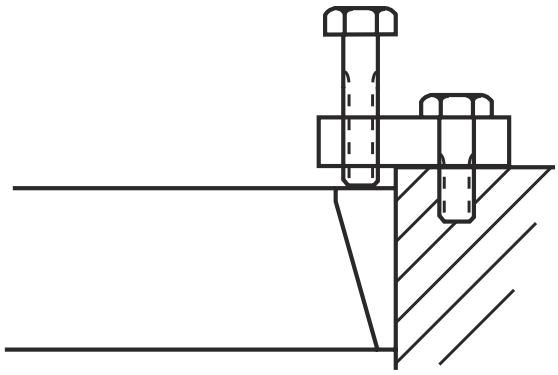
14. Install the spacer (10) against the bearing cup (smaller ID end toward the bearing).

19-4-015

Figure 156. Bearing Housing Spacer (10) Installation

15. Measure the output bearing clearance.

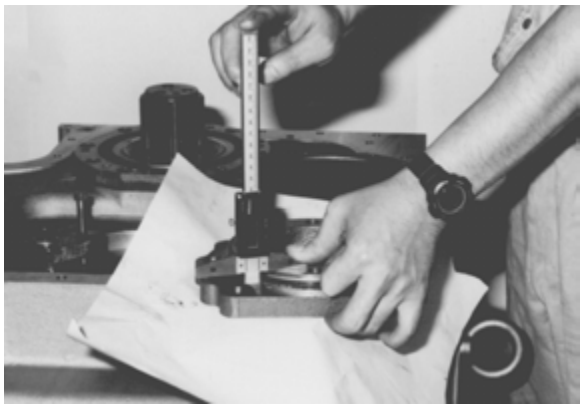
    a. Install two special toolsT-21482-6 (diametrically opposed) to hold the spacer and bearing cup in position.



MG-6619SC-012

Figure 157. Special Tools T-21482-6 Holding Bearing Cup in Position

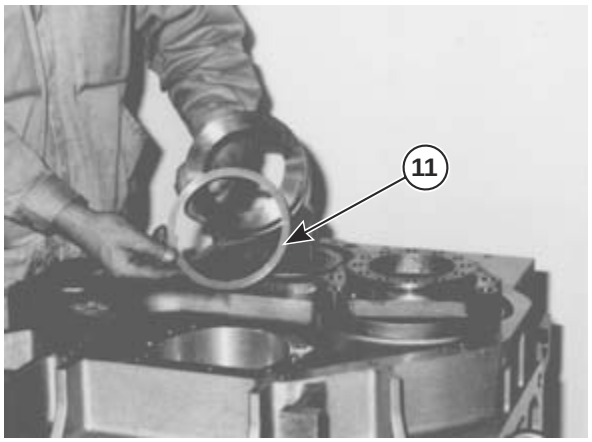
    b. Measure the distance down to the bearing housing spacer at three equally spaced locations. If the dimensions are not the same, realign the bearing cup. When the three dimensions are the same, record the number.
    c. Measure the length of the pilot of the front output bearing cover. Subtact the pilot length from the first dimension.
    d. Determine the shim pack thickness required to obtain 0-0.05 mm (0.002 in) clearance.



19-4-011 19-4-010

Figure 158. Measure Output Bearing Clearance

e. Remove the two special tools T-21482-6.
f. Install the proper thickness shim pack (11) over the bearing cup.

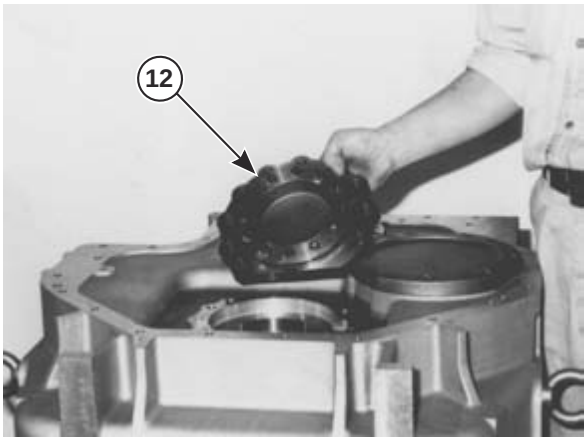


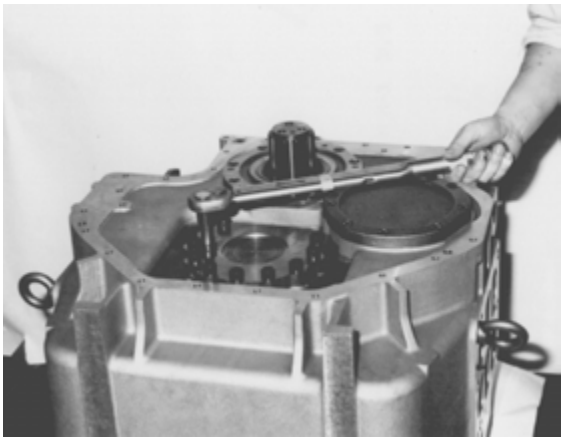
19-4-009

Figure 159. Output Bearing Shim (11) Adjustment

16. Install output bearing cover (12) on the main housing.

a. Fill the 12 spring pockets in the front output bearing cover with grease.
b. Insert the 12 coil springs into the grease-filled pockets.
c. Install the O-ring onto the output bearing cover.
d. Apply grease to both the O-ring and the counterbore in the main housing.
e. Torque the ten attaching screws to 42.1 N•m (31 lb•ft).





19-4-007 19-4-005

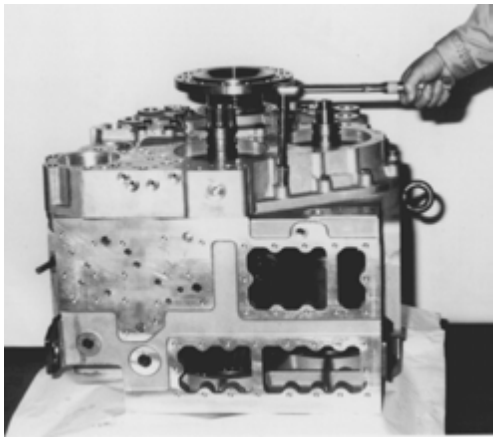
Figure 160. Output Bearing Cover (12) Installation

Clutch Shaft Endplay and Manifold

1. Rotate transmission so that the output end is facing up.

2. Remove support tool T-21482-6 retaining the primary and secondary bearing cups.

3. Install the remaining rear housing attaching screws (if not installed already). Torque the socket-head screws to 56 N•m (41 lb•ft) and the hex-head screws to 45 N•m (33 lb•ft).



19-4-003

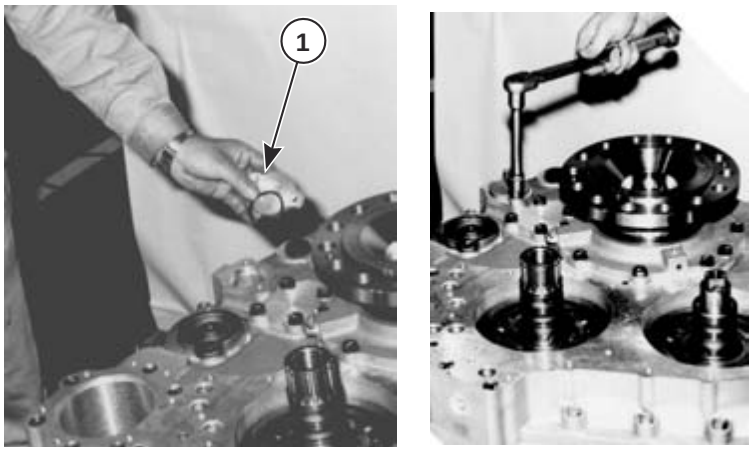
Figure 161. Rear Housing Installation

4. Remove the primary and secondary shaft bearing spacers.

5. Reseat the tapered roller bearing cups lightly with a tubular drive.

Note: If the transmission is equipped with a trailing pump, install the suction screen into the housing.

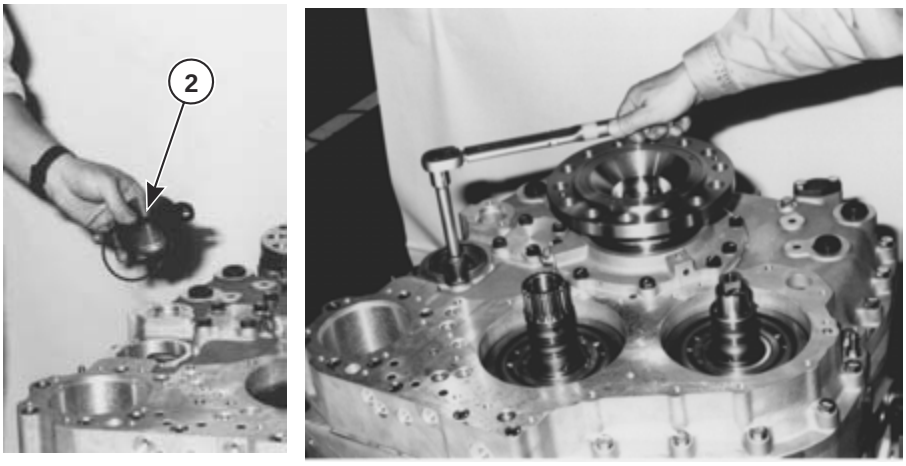
6. Lubricate and install the trailing pump suction port O-ring and cover (1). Torque the screws to 45 N•m (33 lb•ft).



19-4-023 19-4-026

Figure 162. Trailing Pump Suction Port O-ring and Cover (1) Installation

7. Lubricate and install the governor cover and O-ring (2). Torque the screws to 45 N•m (33 lb•ft).

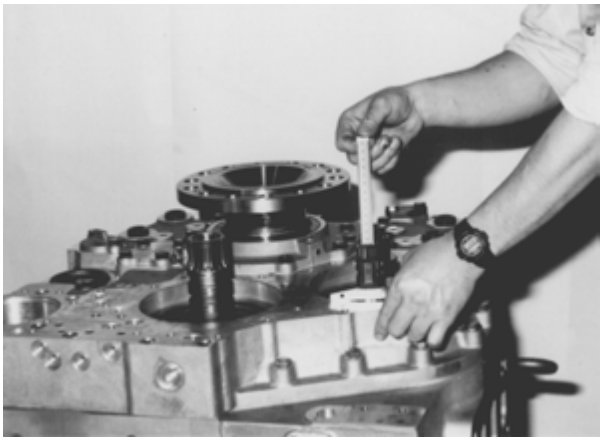


19-4-020 19-4-022

Figure 163. Governor Cover and O-ring (2) Installation

8. Measure the primary and secondary shaft bearing clearance.

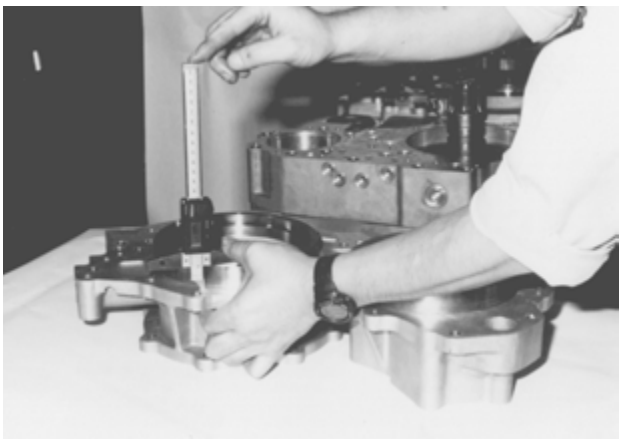
   a. Measure the distance from the housing manifold surface down to the bearing cup at three equally spaced locations around the diameter.

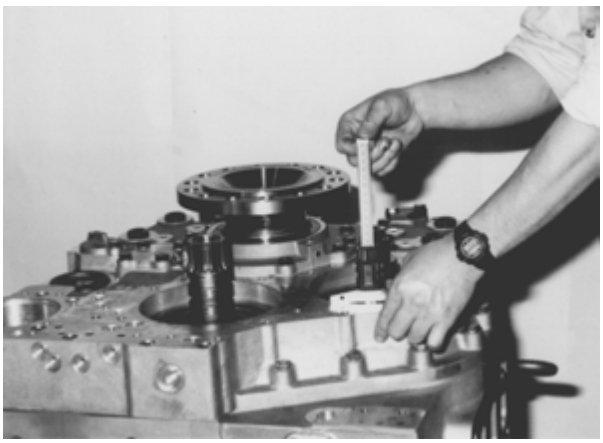


19-4-025 19-4-028

Figure 164. Bearing Cup Measurement

   b. Measure the thickness of the bearing spacer. Subtract the spacer thickness from the first dimension. Determine the shim pack thickness required to result in a -0.05 to 0.05 mm (-0.002 to 0.002 in) clearance.

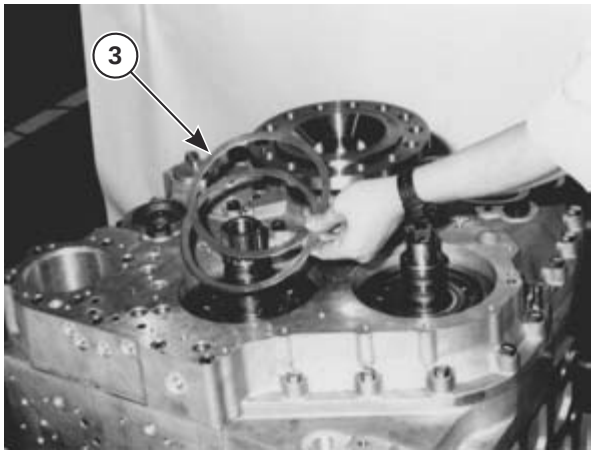


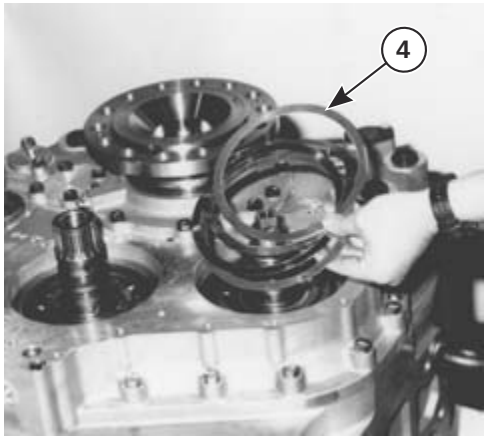


19-4-027 19-4-028

Figure 165. Bearing Spacer Thickness Measurement

c. Install the primary (3) and secondary (4) clutch shaft shim pack.



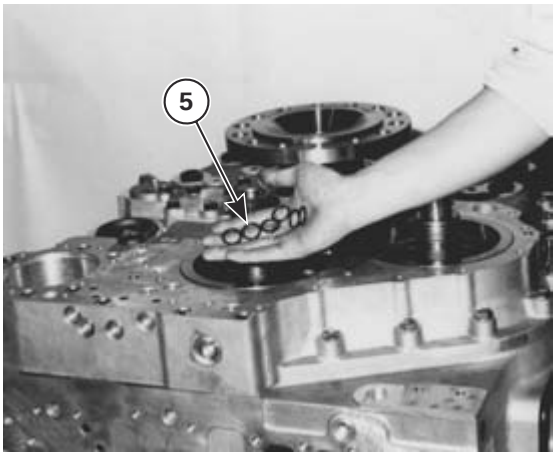


19-4-030 19-4-031

Figure 166. Primary (3) and Secondary (4) Clutch Shaft Shim Pack Installation

9. Reinstall the shaft bearing spacers.

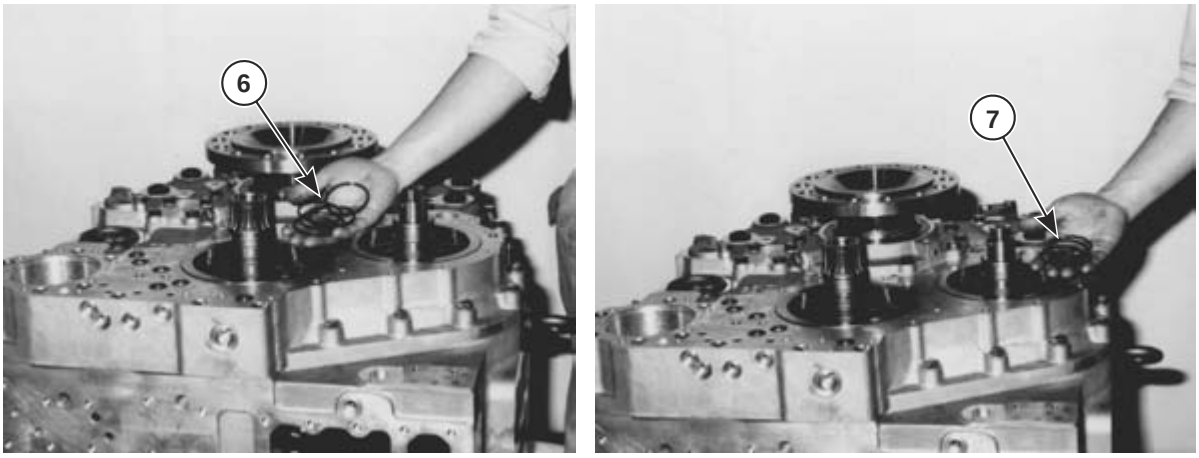
10. Install six O-rings (5) into the counterbores in the rear housing.



19-4-032

Figure 167. Rear Housing O-ring (5) Installation

11. Install five sealing rings (6) onto the primary shaft and four sealing rings (7) onto the secondary shaft.



19-4-033 19-4-034

Figure 168. Primary (6) and Secondary Shaft (7) Shaft Sealing Ring Installation

12. Install the sealing sleeves (8) into the manifold, if removed.

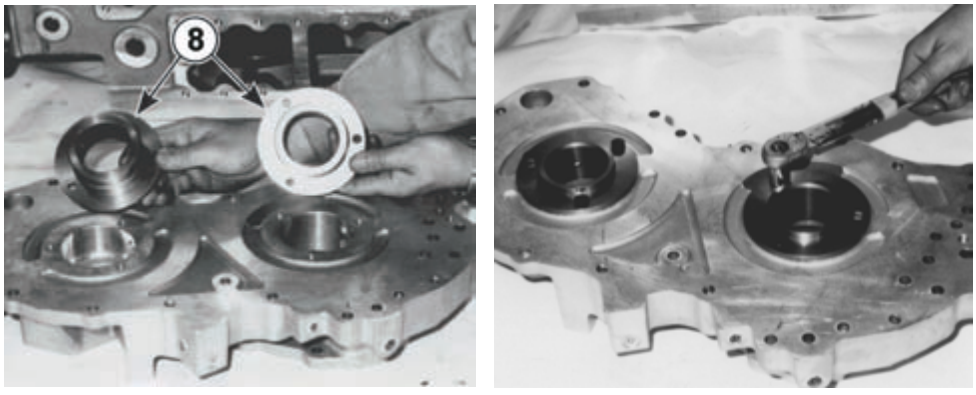
    a. Cool the sealing sleeves to -40°C (-40°F) before installing.

⚠ WARNING

Handle the sealing sleeves with care. The sleeves are extremely cold.

    b. Apply a thin film of grease to the bores of the manifold sealing sleeves.

    c. Torque the capscrews securing the manifold sealing sleeves to 22 N•m (16 lb•ft).

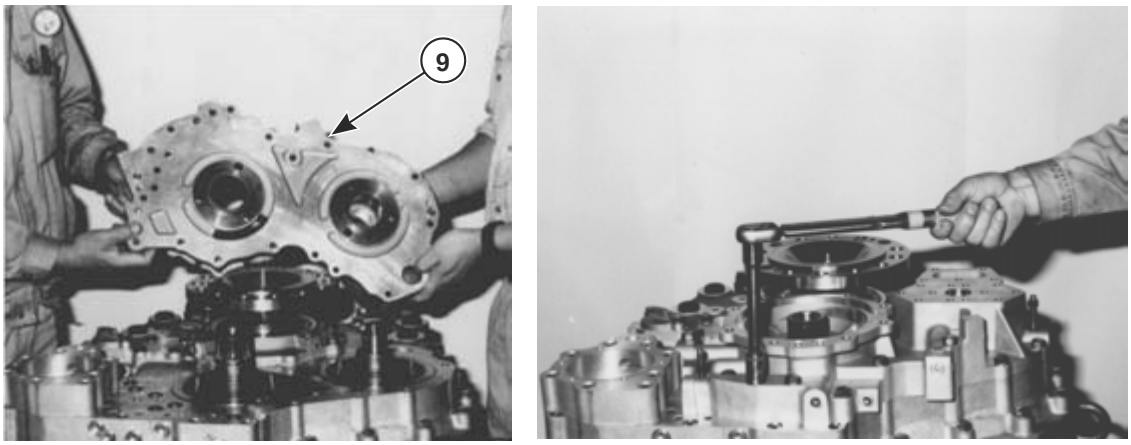


19-4-035 2012-001

Figure 169. Manifold Sealing Sleeves (8) Installation

13. Install the manifold (9) onto the rear housing cover.

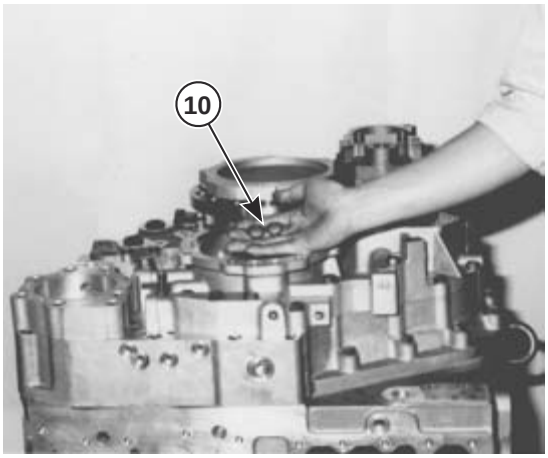
    a. Apply MA1015 sealer to the manifold sealing surface around the pump suction port.
    b. Start fastening the manifold with the attaching screws. There are five different length fasteners used.
    c. Drive the dowel pins until they bottom out.
    d. Torque the attaching screws to 56 N•m (41 lb•ft).



2012-005 2012-007

Figure 170. Manifold (9) Installation

14. Install two O-rings (10) into the counterbores in the manifold.

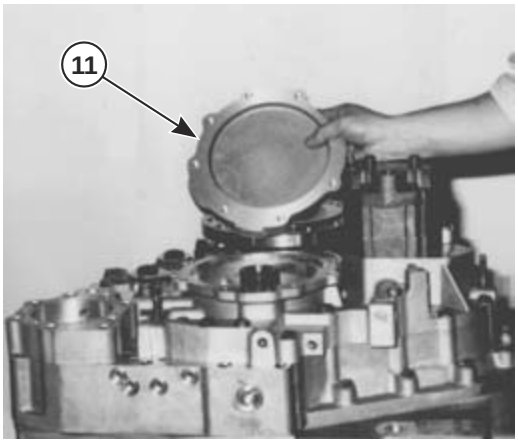


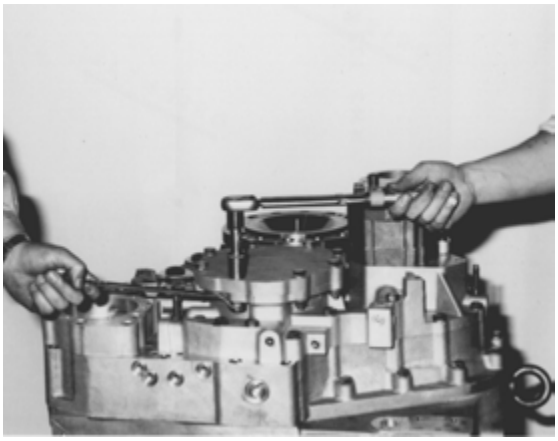
2012-017

Figure 171. Manifold O-ring (10) Installation

15. Install the PTO cover (11) onto the manifold.

    a. Apply MA1015 sealer to the PTO cover sealing surface before installation.
    b. Fasten the PTO cover attaching bolts, flat washers and nuts.
    c. Torque the bolts to 45 N•m (33 lb•ft).





2012-018 2012-022

Figure 172. PTO Cover (11) Installation

Transmission External Components

Pump and Suction Screen

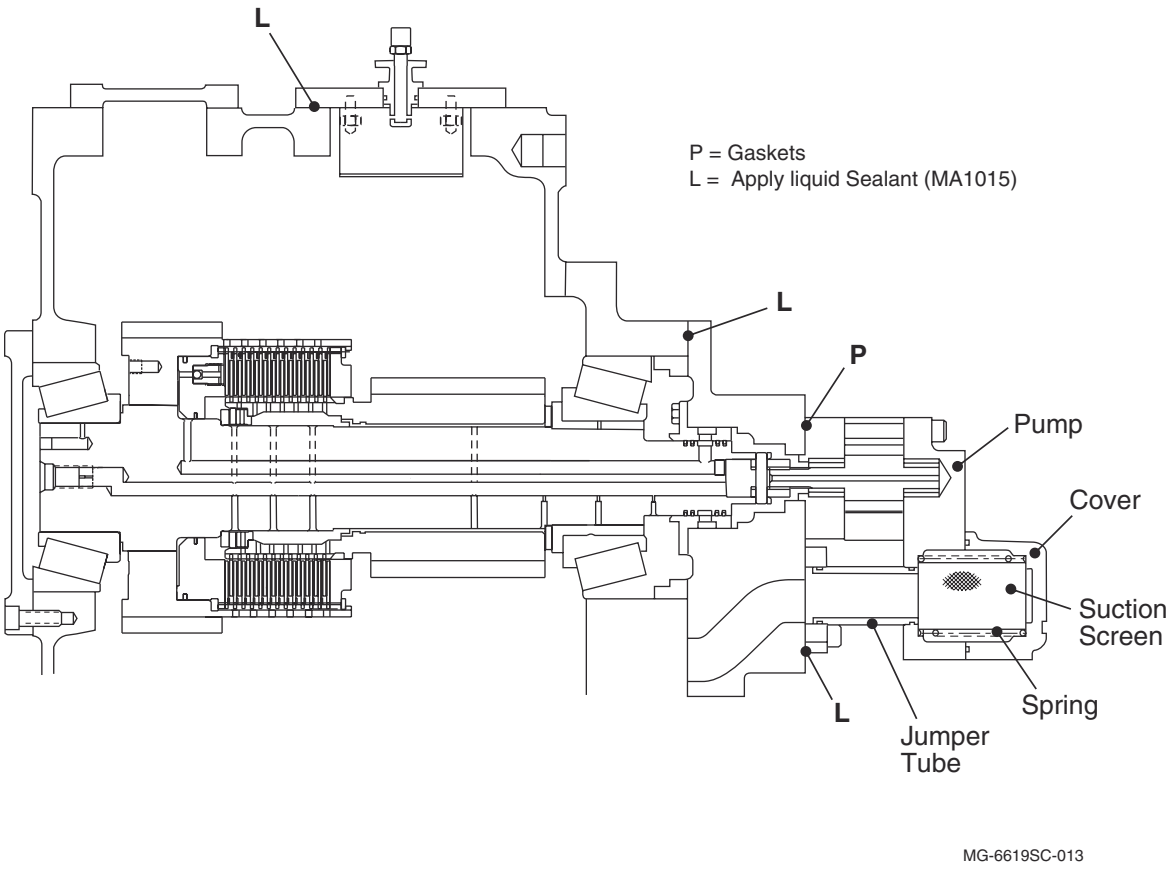
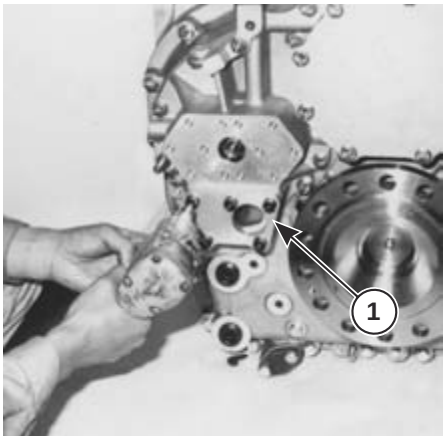


Figure 173. Pump Component Identification and Location

1. Apply MA1015 sealer to the surface of the pump suction adapter plate.

2. Install the pump suction adapter plate (1) (if removed). Torque the screws to 46 N•m (34 lb•ft).

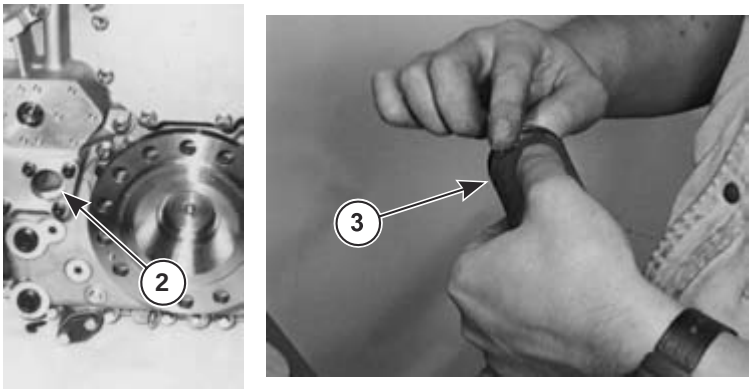


2052-031

Figure 174. Seal and Install Pump Suction Adapter Plate (1)

3. Lubricate the pump suction jumper tube bore (2).

4. Install O-rings on each end of the pump jumper tube (3). Lubricate the O-rings.



2052-031a AAR289-6557

Figure 175. Jumper Tube (3) Lubrication

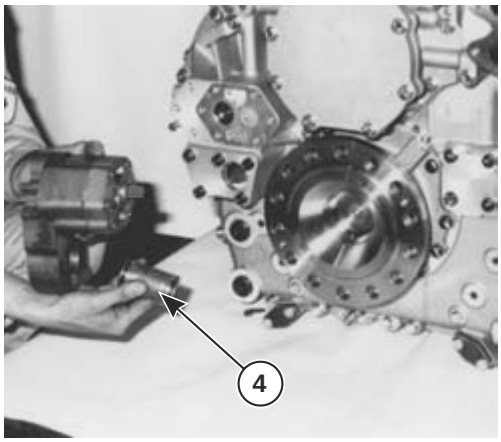
5. Install the pump mounting gasket.

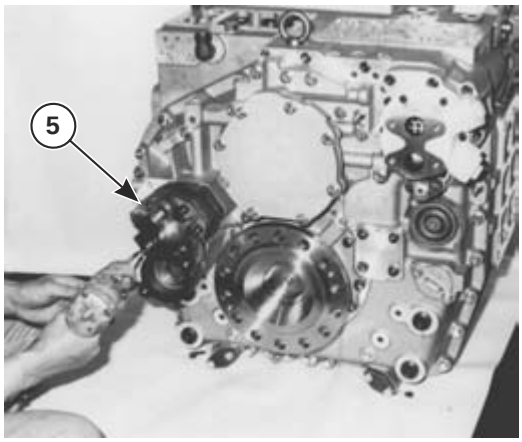
   Note: The larger of the two round holes is for the pump shaft.

6. Install the jumper tube (4) into the pump suction adapter plate.

7. Install the pump (5). It may be necessary to rotate the primary shaft to allow the pump shaft to align during installation. Torque the screws to 46 N•m (34 lb•ft).

   Note: The jumper tube (4) should rotate freely by hand with the O-rings installed after the pump is mounted and the bolts are tightened.





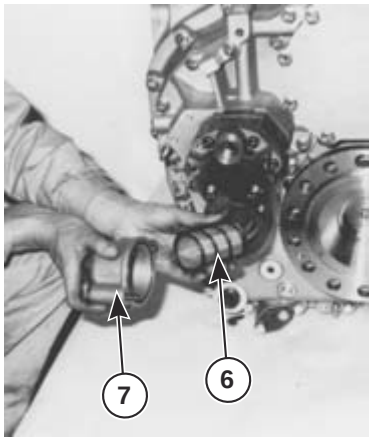
2052-033 2052-034a

Figure 176. Jumper Tube (4) and Pump (5) Installation

8. Install the suction strainer (6).

9. Install the suction strainer O-ring and cover (7). Torque the screws to 45 N•m (33 lb•ft).

   Note: Do not crush the suction strainer.



2052-035a

Figure 177. Suction Strainer (6) and Cover (7) Installation

Heat Exchanger

Heat exchangers furnished by Twin Disc to be used in salt water applications have zinc anode rods installed at the heat exchanger inlet and outlet heads. These rods must be checked every 90 days. If over 50% of the rod is disintegrated, it should be replaced to provide effective protection.

Excessive corrosion of the zinc anode rod indicates electrolytic action. A careful inspection should be made to determine if this action is caused by a short circuit or externally grounded electrical current. If these conditions do not exist, it is evident the corrosion is due to local electrolysis.

If the zinc anode rods are corroded with foreign materials, they should be cleaned with a wire brush.

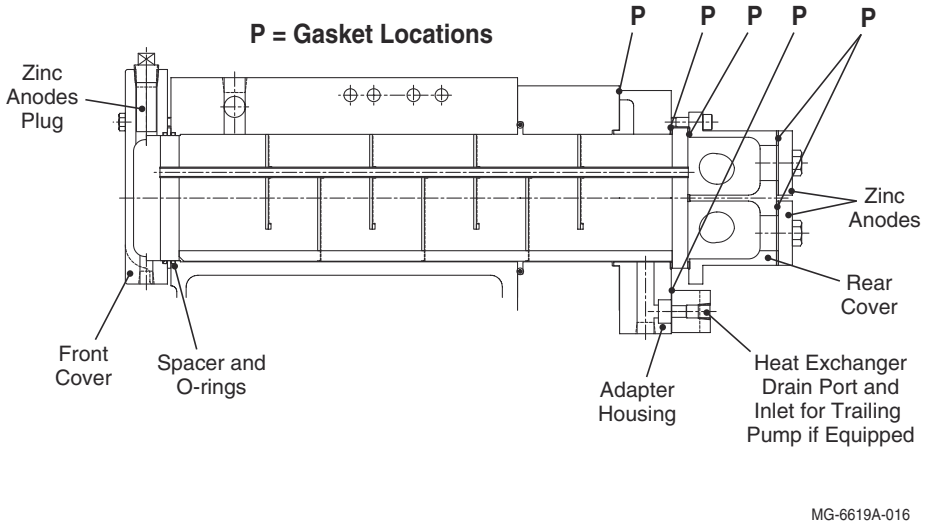
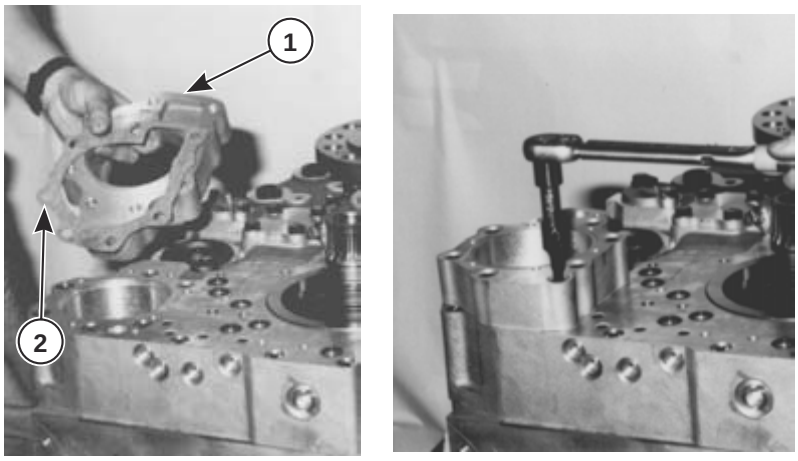


Figure 178. Heat Exchanger Component Identification and Location

1. Install the heat exchanger adapter plate (1) and gasket (2). Torque the attaching screws to 56 N•m (41 lb•ft).

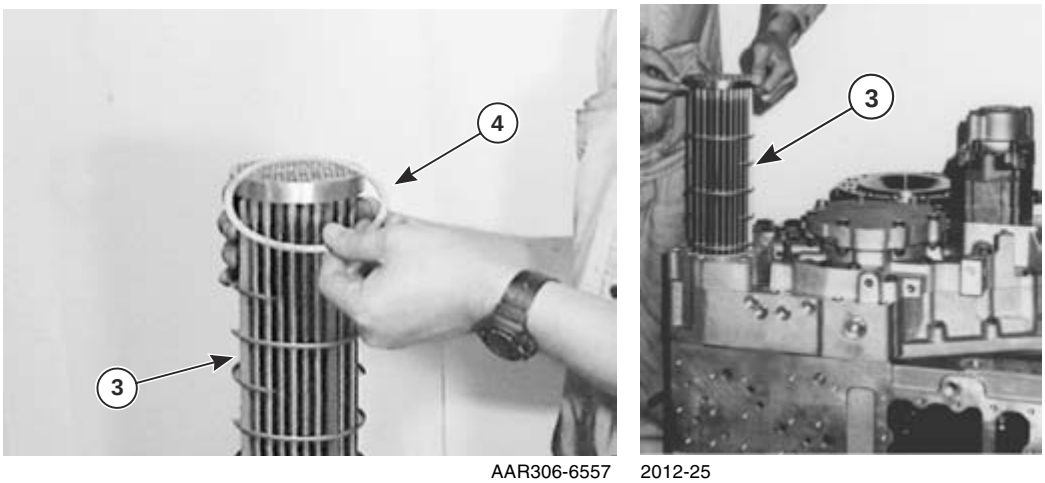


2012-02 2012-04

Figure 179. Heat Exchanger Adapter Plate (1) and Gasket (2) Installation

2. Install the heat exchanger core (3) with the mark made during disassembly at the top. Place the heat exchanger into the main transmission housing with the divider located horizontally in the housing.

3. Install the heat exchanger gasket (4). The gasket is placed between the flange on the heat exchanger core and the base.

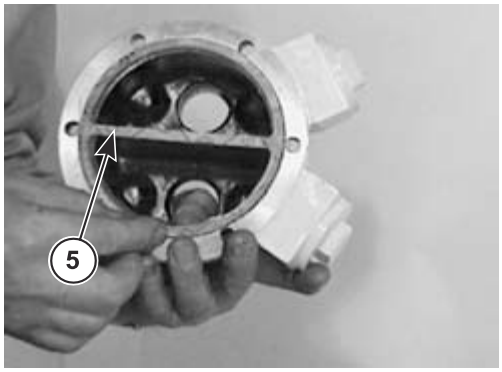


AAR306-6557 2012-25

Figure 180. Heat Exchanger Core (3) and Gasket (4) Installation

4. Attach the heat exchanger gasket (5) (with divider) onto the heat exchanger rear cover.

   a. Apply grease between the rear cover and gasket.
   b. Attach the heat exchanger gasket onto the rear cover with grease.

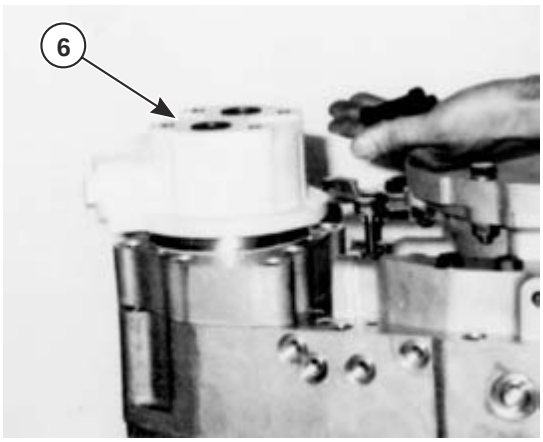


AAR312-6557

Figure 181. Heat Exchanger Gasket (5) Lubrication and Attachment

5. Install heat exchanger rear cover (6) over the heat exchanger core.

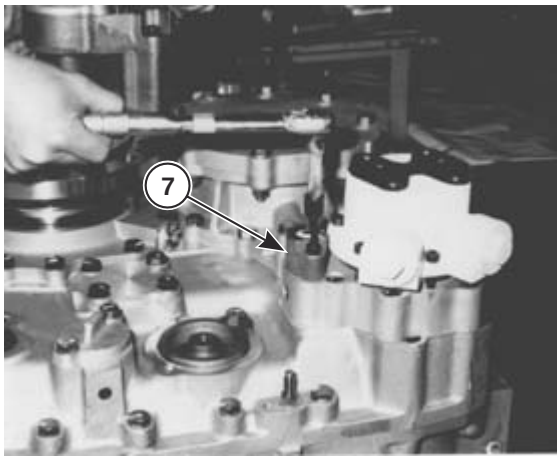
   a. The divider in the heat exchanger, along with the rear cover and gasket, separates the input from the outlet of the heat exchanger.
   b. The heat exchanger positioning can be verified through the inlet/outlet ports.
   c. Torque the attaching fasteners evenly to 22 N•m (16 lb•ft).



2012-26 2012-27

Figure 182. Heat Exchanger Cover (6) Installation

6. Install the heat exchanger drain plug adapter (7) and gasket (if removed). Torque the attaching screws to 45 N•m (33 lb•ft)



2012-28

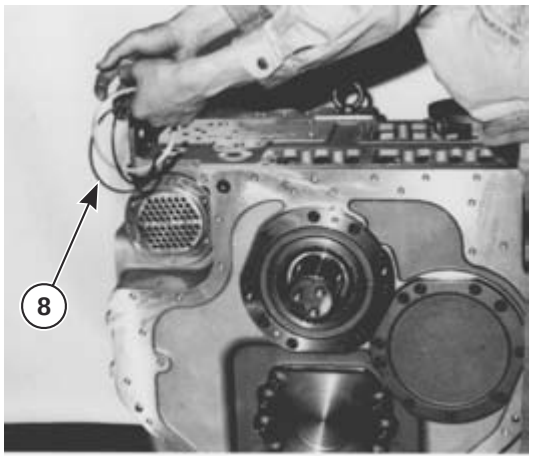
Figure 183. Heat Exchanger Drain Plug Adapter (7) Installation

7. Remove the protective tape from the output shaft.

8. Rotate the transmission with a hoist so the input side is at the top.

   Note: Be sure the transmission is supported securely.

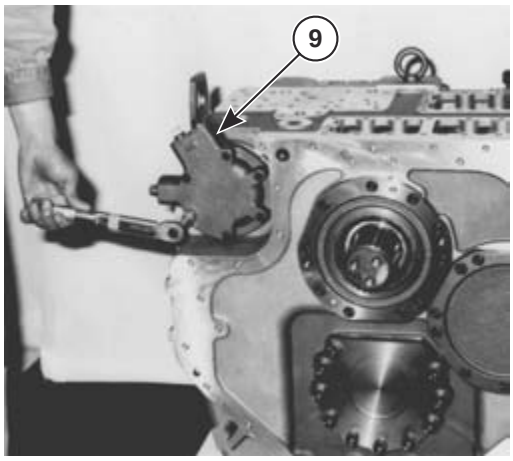
9. Install O-rings and steel spacer ring (8) over the front of the heat exchanger core. Apply grease to the O-rings before installation.



2012-29

Figure 184. O-rings and Steel Spacer Ring (8) Installation

10. Install the heat exchanger front cover (9) over the heat exchanger core. Torque the attaching fasteners evenly to 22 N•m (16 lb•ft).



2012-30

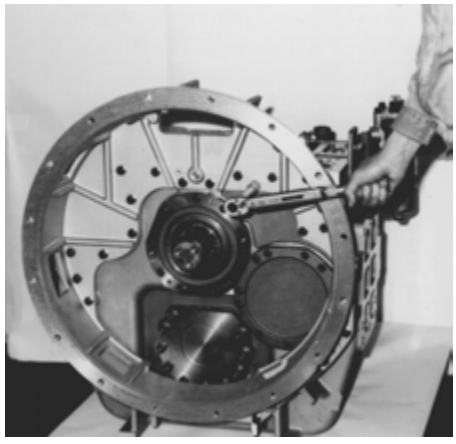
Figure 185. Heat Exchanger Front Cover (9) Installation

Note: If the heat exchanger is not properly installed in the main housing, the transmission could overheat.

Front Housing

1. Install the transmission front housing (1) onto the main housing. Torque the attaching fasteners to 56 N•m (41 lb•ft).

2. Drive the front housing dowel pins until the ends are flush.



2012-34

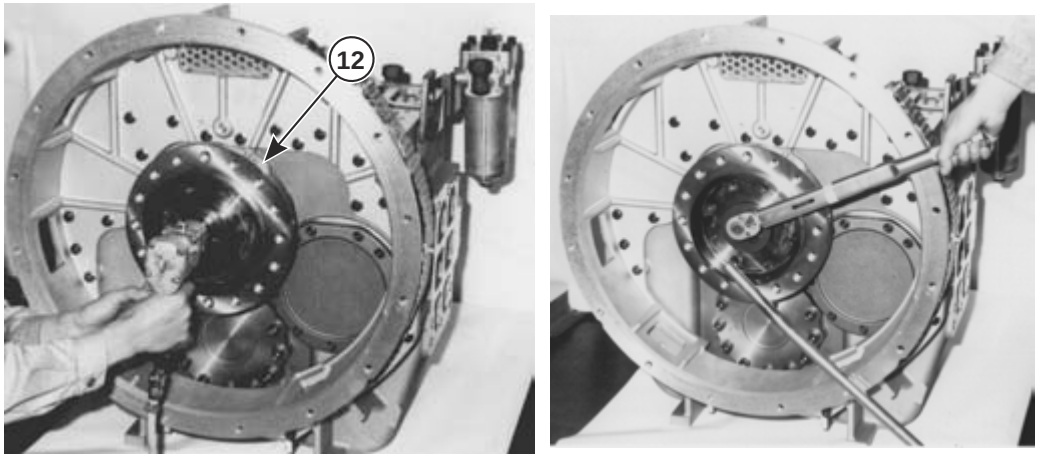
Figure 186. Transmission Front Housing (1) Installation

3. Install the input hub (12) onto the primary shaft.

   a. Apply molydisulfide grease to the splines at the input end of the primary shaft.
   b. Heat the input hub to 120°C (250°F).

⚠ WARNING
Handle the input hub with care. The hub is HOT.

   c. Drive the input hub until it is properly seated.
   d. Ensure that the O-ring groove is free from debris and install the sealing O-ring.
   e. Install the retaining washer and three attaching capscrews.
   f. Torque the three capscrews to 118 N•m (87 lb•ft).



2053-032 2053-033

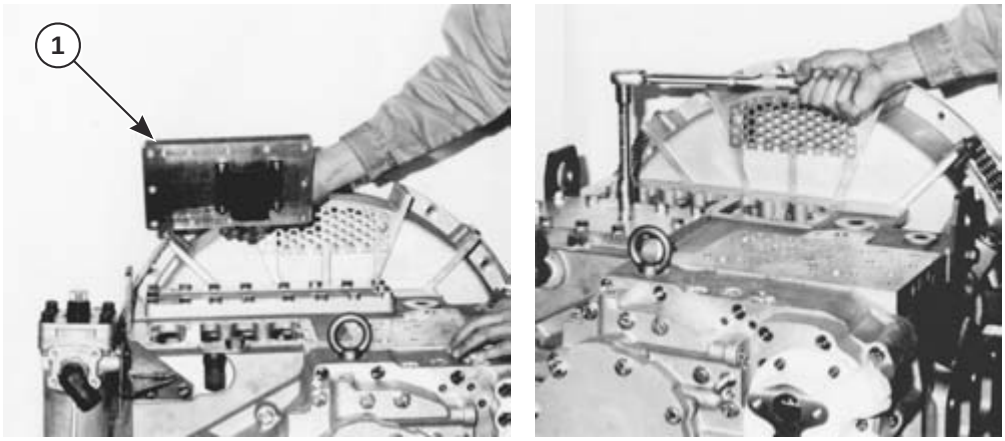
Figure 187. Input Hub Installation

Top Cover, Access Cover and Oil Level Gauge Tube

1. Apply MA1015 sealer to the transmission top cover sealing surface of the main housing.

2. Install the transmission top cover (1) onto the main housing. Torque the attaching screws to 45 N•m (33 ft•lb).

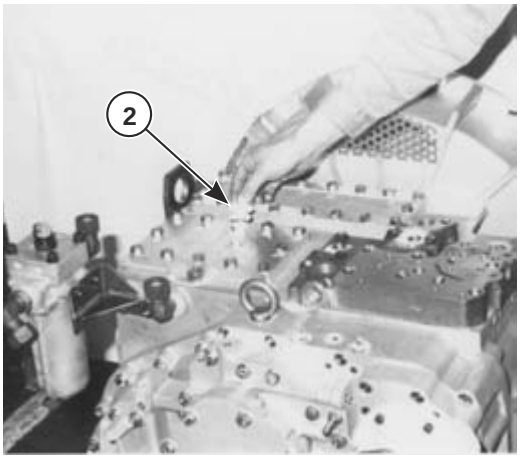
   Note: On the bottom surface of the top cover is an oil baffle to prevent leakage through the oil filler cap/breather. **Do not** remove the baffle from the top cover unless replacement is necessary.



2053-003 2053-028

Figure 188. Transmission Top Cover (1) Installation

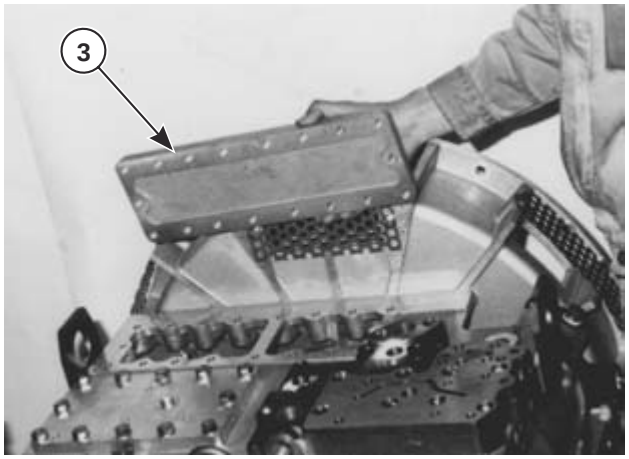
3. Install the filler cap/breather (2) onto the transmission top cover. Apply grease to the sealing ring of the oil filler cap/breather before installation.

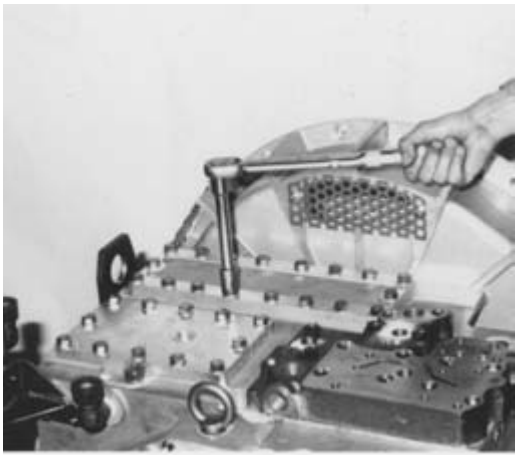


2053-018

Figure 189. Oil Filler Cap/Breather (2) Installation

4. Apply MA1015 sealer to the surface of the output gear access cover. Install the output gear access cover (3) onto the main housing. Torque the attaching screws to 45 N•m (33 ft•lb).



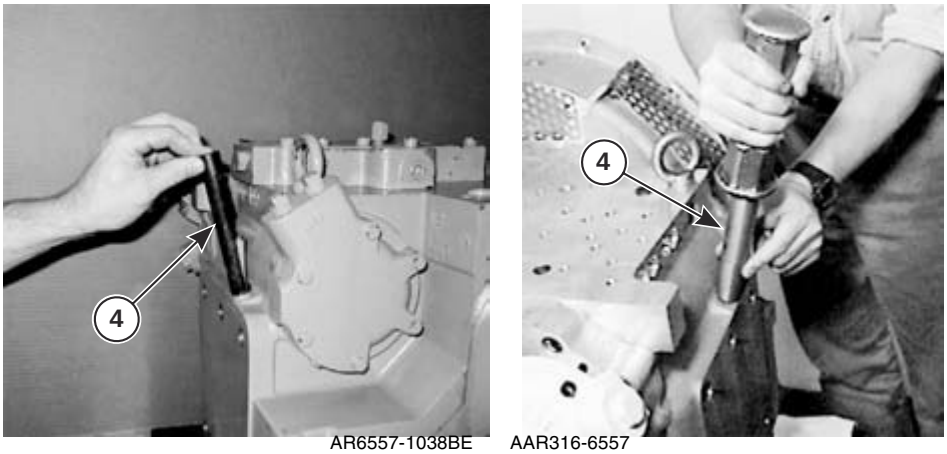


2053-021 2053-019

Figure 190. Output Gear Access Cover (3) Installation

5. Install the oil level gauge tube (4) into the main housing (if removed).

   a. Place Special Tool T-21578-2 over the top of the oil level gauge tube.
   b. Gently tap the oil level gauge tube into the main housing.

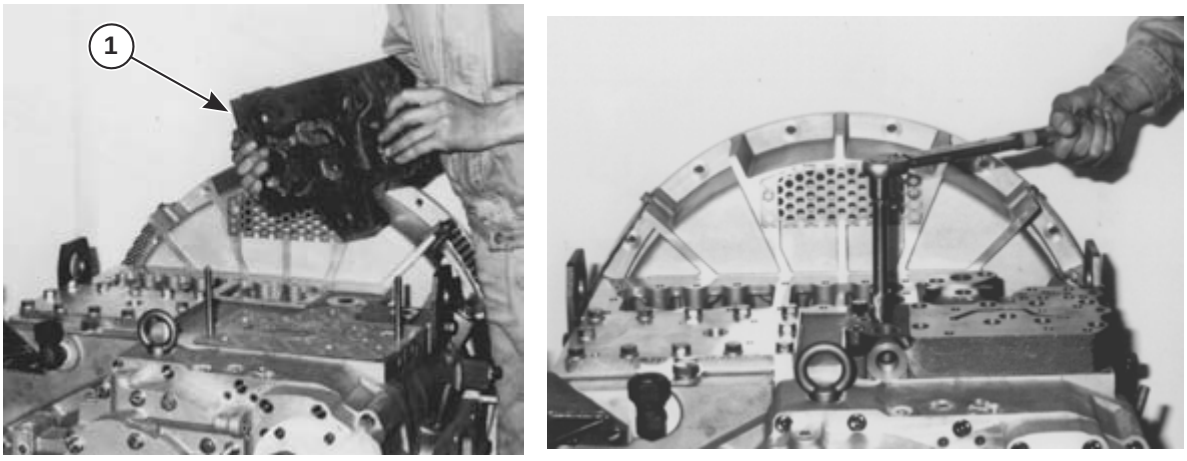


AR6557-1038BE AAR316-6557

Figure 191. Oil Level Gauge Tube (4) Installation

Ditch Plate, Lube Priority Valve, Pressure Relief Valve and Selector Valve

1. Install the ditch plate and gasket (1) on top of the transmission main housing.

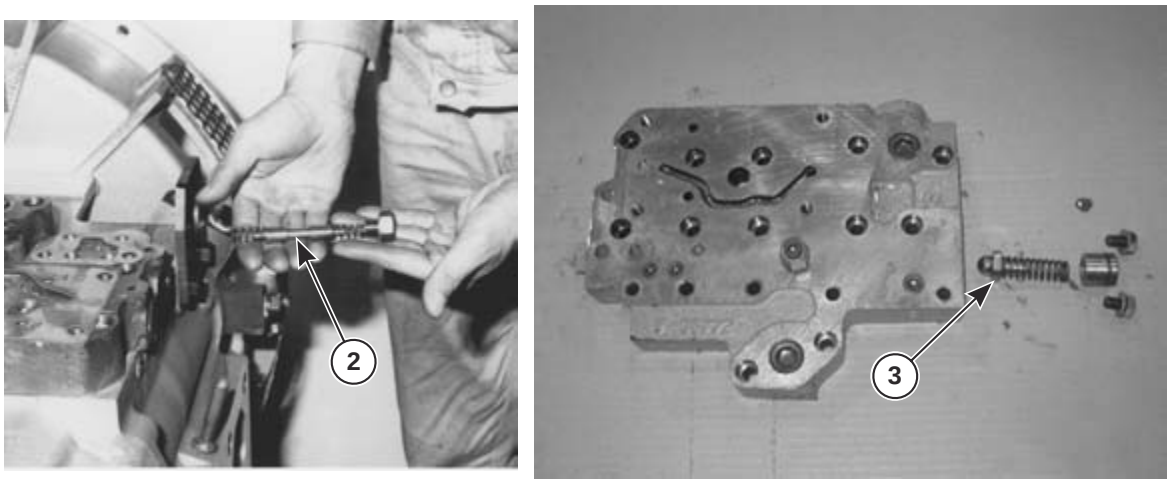


2053-027 2053-026

Figure 192. Ditch Plate and Gasket (1) Installation

2. Install the lube priority valve (2) into the bore of the ditch plate.

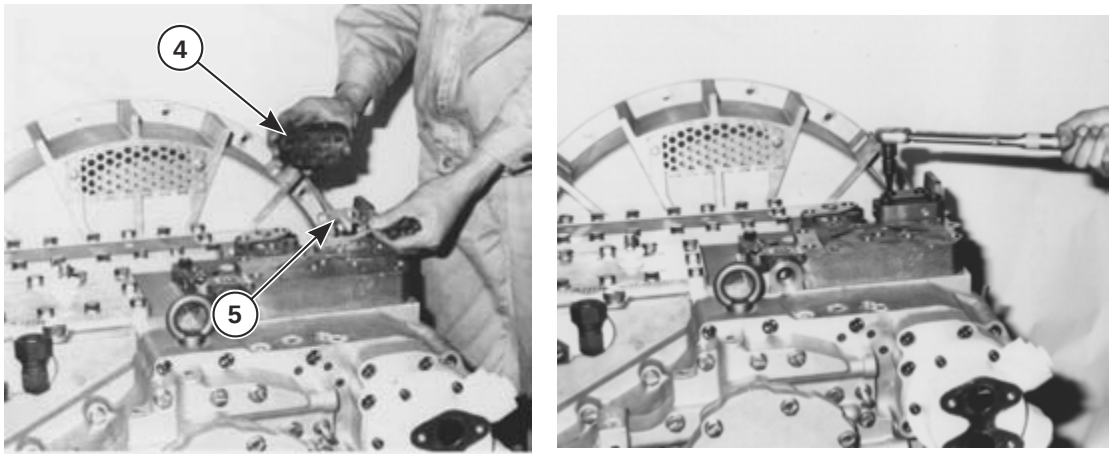
3. Install the lube pressure relief valve (3) into the bore of the ditch plate.



2053-011 R6557-017BE

Figure 193. Lube Priority (2) and Pressure Relief Valve (3) Installation

4. Install the lube priority valve cover (4) and gasket (5) on top of the transmission main housing. Torque the attaching screws to 56 N•m (41 lb•ft).



2053-008 2053-009

Figure 194. Lube Priority Valve Cover (4) and Gasket (5) Installation

5. Install selector valve assembly and gasket. Torque the attaching screws to 56 N•m (41 lb•ft). (See next section for selector valve assembly).

Control Valve

Assembly of Electrical Control Valve (upper body half)

1. Install one dowel pin (large diameter) into each of the two bores of the valve body.

2. Install one spring into each of the two bores of the valve body.

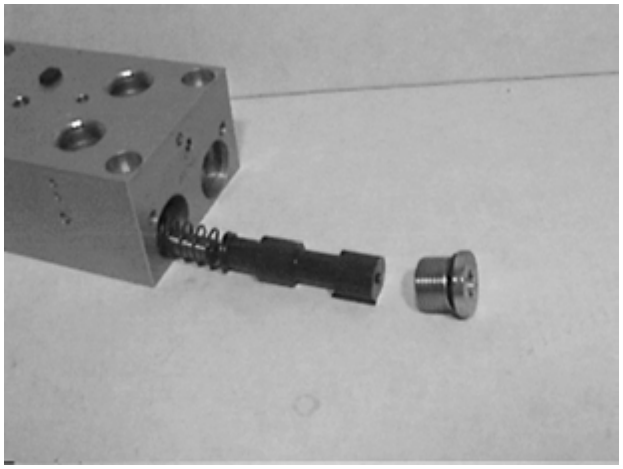


Figure 195. Dowel, Return Spring, Spool, and Plug

3. Install one spool into each of the two bores of the valve body.

4. On units equipped with the hydraulic lock feature, install one spring followed by one pin (small diameter) into each of the spools.

5. Install the two O-ring plugs into the valve body and tighten to 85 N•m (63 lb•ft.)

6. Apply lubricant (such as Dow Corning 200® 30,000cSt fluid) to the O-rings of the solenoids and plug (plug used on units without hydraulic lock). Install solenoids (and plug, if equipped) into the valve body and torque them to 34 N•m (25 lb•ft).

7. Insert the wires (pins) into the Weatherpak connector according to the location markings made at disassembly. Close the end of the Weatherpak connector to lock the wires in position.

8. Install the Weatherpak connector onto its retaining clip on the top of the valve body.

Assembly of Electrical Control Valve (lower body half)

1. Install the steel shuttle ball into its bore in the valve body.

2. Install the O-ring onto the shuttle ball seat.

3. Apply lubricant such as Dow Corning 200® 30,000cSt fluid to the O-ring, and install the seat into the valve body. Be sure to align the roll pin holes in the seat with the holes in the valve body. One of the valve's M8-1.25 cover screws threaded into the seat can be used to adjust the seat location in the valve body.

4. Install the roll pin to retain the shuttle ball seat. Drive the roll pin in until it is flush with the gasket surface of the valve body.

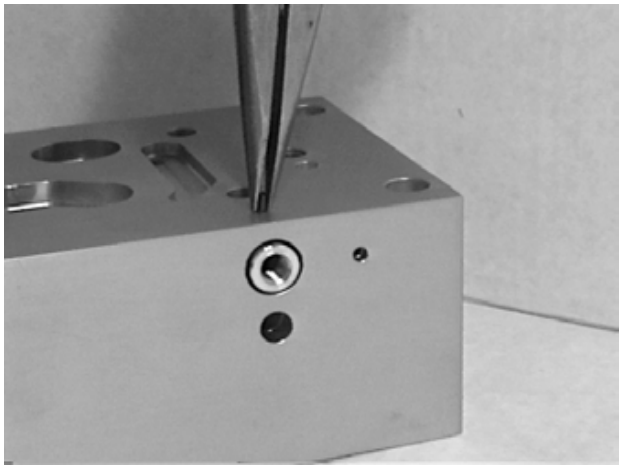


Figure 196. Installing Shuttle Ball Seat Roll Pin

5. Install the stem into the valve body, aligning the slot in the stem with the threaded hole in the valve body for the dog-point setscrew. Be sure the slot in the stem is aligned with the setscrew hole in the valve body to prevent damage to the stem and valve body.

6. Apply MA908 threadlocker to the threads of the dog-point setscrew and install. Tighten the dog-point setscrew until snug, then back off 1/2 turn.

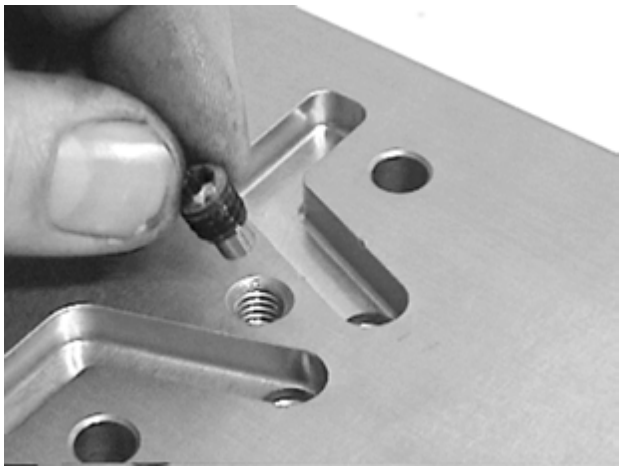


Figure 197. Installing Dog-point Setscrew

7. Install the steel detent ball into the valve body.

8. Install the detent spring over the detent ball.

9. Apply MA908 threadlocker to the threads of the hollow setscrew and install into the threaded hole. A stepped Allen wrench, or one wrapped with tape will ease the installation of the hollow setscrew. Tighten the setscrew until it is flush with the gasket surface of the valve body. Check the stem rotation and detent action.

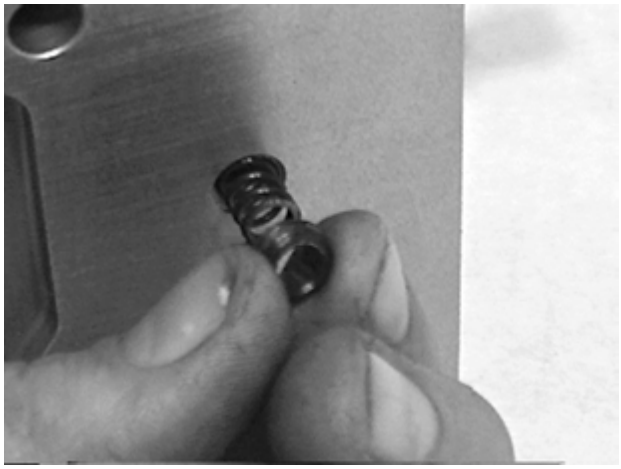


Figure 198. Installing Detent Ball Setscrew

10. Install the thrust washer over the end of the stem.

11. Press the oil seal into the cover assembly until flush with the adjacent cover surface.

12. Install the O-ring into the counterbore in the cover assembly.

13. Apply grease to the stem, O-ring, and oil seal lip.

14. Install cover assembly and gasket onto valve body. Be sure to align the oil drain hole in the gasket with the hole in the valve body.

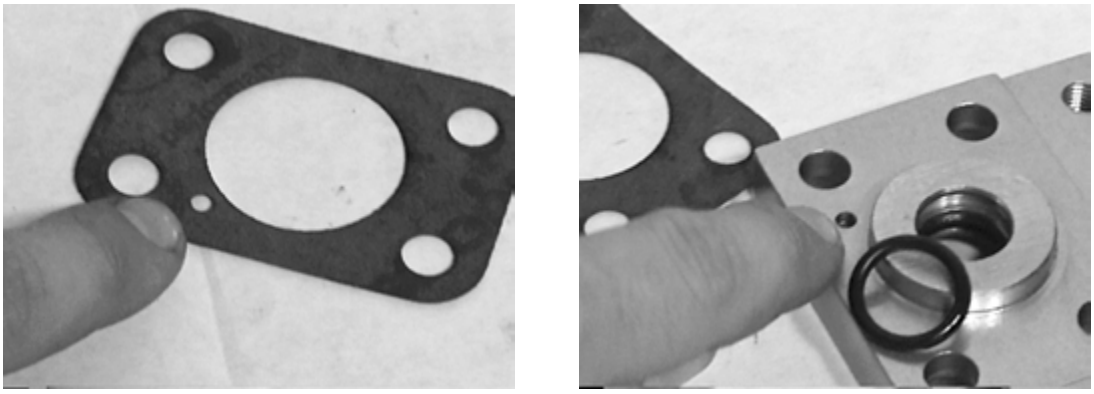


Figure 199. Holes in Gasket and Cover Must be Aligned

15. Install cover capscrews and torque to 23 N•m (17 lb•ft).

16. Install washer over stem and against oil seal.

17. Install spring over stem against washer.

18. Install lever onto the stem. It may be necessary to splay the lever to be able to install it. **DO NOT** apply any impact force to the lever, as the stem or dog-point setscrew may be damaged. Torque the lever's attaching screw to 9.5 N•m (7 lb•ft).

19. Install external retaining ring onto stem .

20. Install the steel balls and electrical switches into the bores in the sides of the valve body (if equipped). Note that the small diameter ball is inboard of the large diameter ball at each switch location.

21. Install the pressure regulating piston into valve body with spring pocket out.

22. Install pressure regulating springs into valve body and into piston spring pocket.

23. Install the shims that were removed into the bore of the rate-of-rise piston. Install the rate-of-rise piston over the springs and into valve body.

24. Install neutral pressure regulating spring into the pocket of valve body.

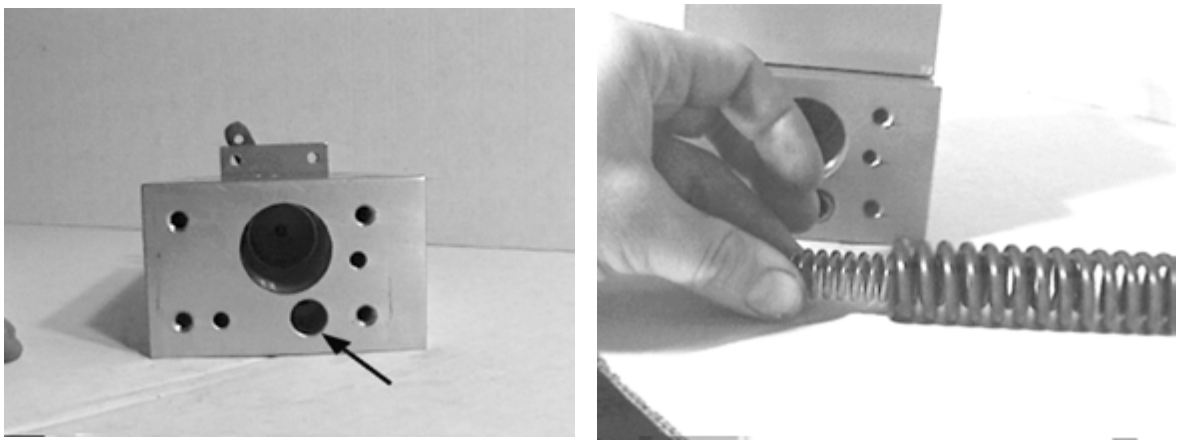


Figure 200. Neutral Pressure Regulating Spring Location

25. Install screen, if equipped, and install orifice plate gasket onto valve body.

26. Install orifice plate and steel ball (against spring) onto valve body.

27. Install orifice plate cover and gasket onto valve body. Install cover capscrews and torque to 23 N•m (17 lb•ft).

28. Install gasket over lower valve body half.

29. Set upper valve body half over lower valve body half. Insert the valve attaching screws through valve body halves to keep parts in alignment until installation onto the transmission. When installing the valve onto the transmission, torque the screws to 54 N•m (40 lb•ft.).

Assembly of Trolling Valve (optional equipment)

1. Press a new oil seal into the counterbore in the end of the adapter. Install a new O-ring into the groove of the adapter.

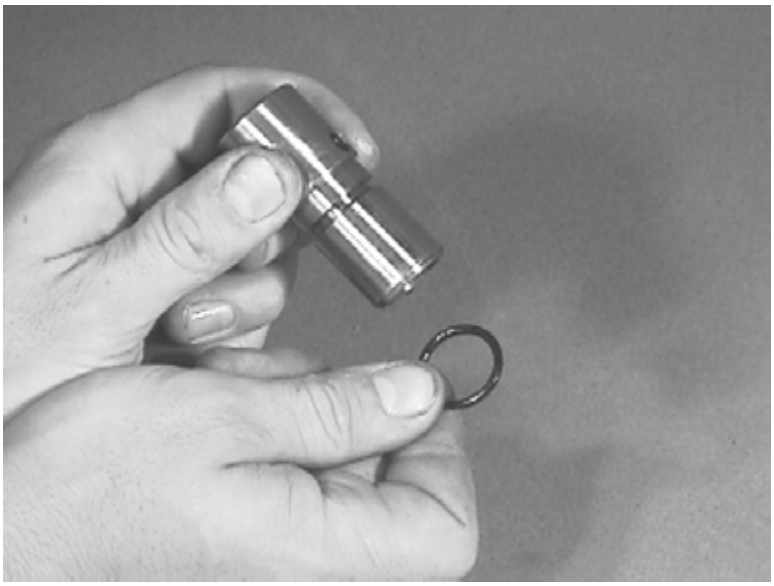


Figure 201. Installing O-ring onto Adapter

2. Install a new O-ring into the groove of the stem.

3. Install the roll pin into the end of the stem (if removed).

4. Install the inner spring onto the roll pin in the stem end with a counter-clockwise twisting motion. The spring should be installed onto the roll pin so that the first coil contacts the end of the stem.

5. Apply assembly grease to the stem from the O-ring to the reduced diameter end. Install the stem into the adapter, with the reduced diameter end entering the adapter first. Adjust the position of the stem if necessary to bring the helical slot into alignment with the dog-point setscrew hole.

6. Install the large diameter washer (used on some models) inside the bore of the adapter and over the inner spring until it lays flat on the end of the stem.

7. Install the small washer (used on some models) inside the piston. The washer must lie flat at the bottom of the bore in the piston.

8. Apply assembly grease to the adapter (where it contacts the trolling valve body) and install the adapter into the valve body. Be sure to align the setscrew holes in the adapter with those in the valve body.

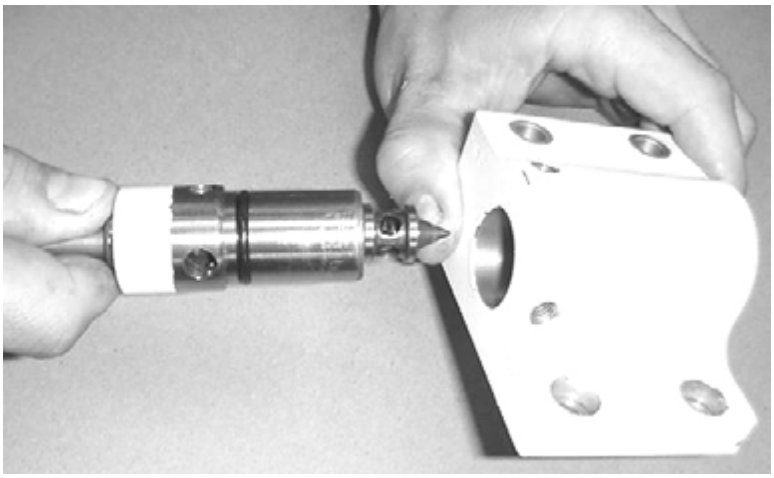


Figure 202. Installing Trolling Valve Parts Into Trolling Valve Body

9. Apply MA908 threadlocker to the threads of the dog-point setscrew and install. Tighten the dog-point setscrew until snug, then back off 1/2 turn. The end of the setscrew should protrude approximately 3 mm from the valve body when the dog point of the setscrew is fully engaged in the helical slot.

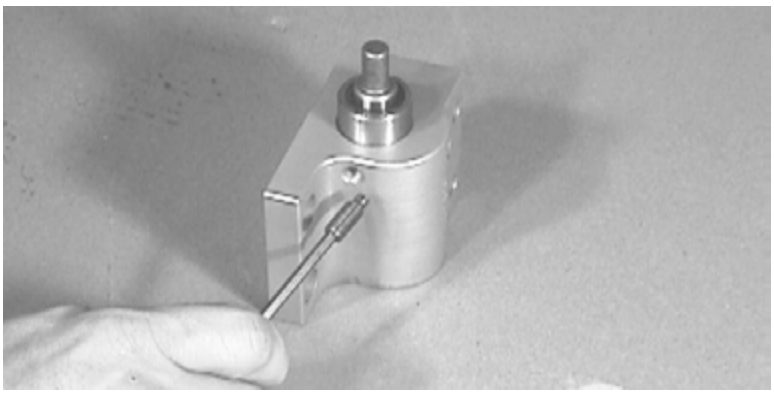


Figure 203. Installing Dog-point Setscrew

10. Check the action of the stem in the trolling valve. If the stem does not rotate 90° smoothly, loosen the dog-point setscrew 1/8 turn and recheck the action of the stem.

11. Install the detent ball and spring into the remaining hole in the valve body. Apply MA908 threadlocker to the threads of the detent setscrew and install until flush with the valve body.

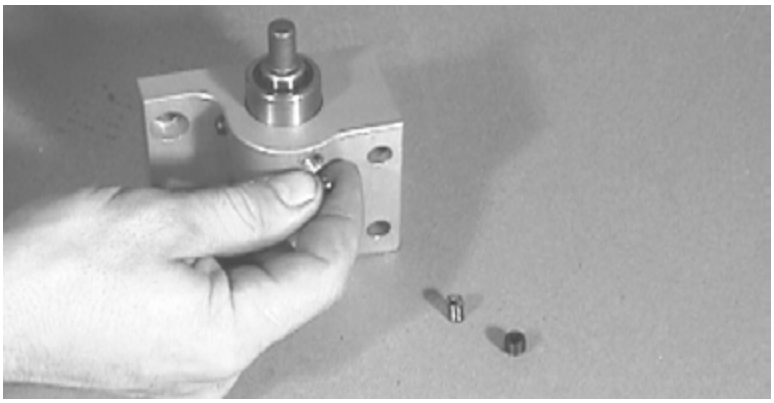


Figure 204. Installing Detent Ball, Spring, and Setscrew

12. Check the torque required to overcome the detent. The torque should be 11-17 N•m (10-15 lb•ft). Adjust the detent setscrew if necessary to achieve the proper torque to rotate the lever out of the detent position.

13. Install the lever onto the stem. It may be necessary to splay the lever to be able to install it. **DO NOT** apply any impact force to the lever, as the stem or dog-point setscrew might get damaged.

14. Rotate the lever (if necessary) on the stem to the position shown on the valve installation drawing (see Engineering Drawing Section of this manual). Install the screw and nut to clamp the lever to the stem. Tighten the screw and nut to 9.5 N•m (7 ft•lb).

15. Install the neutral pressure regulating spring into the bore of the control valve (if removed).

16. Install the screen into the pocket. Install the steel ball onto the neutral pressure regulating spring.

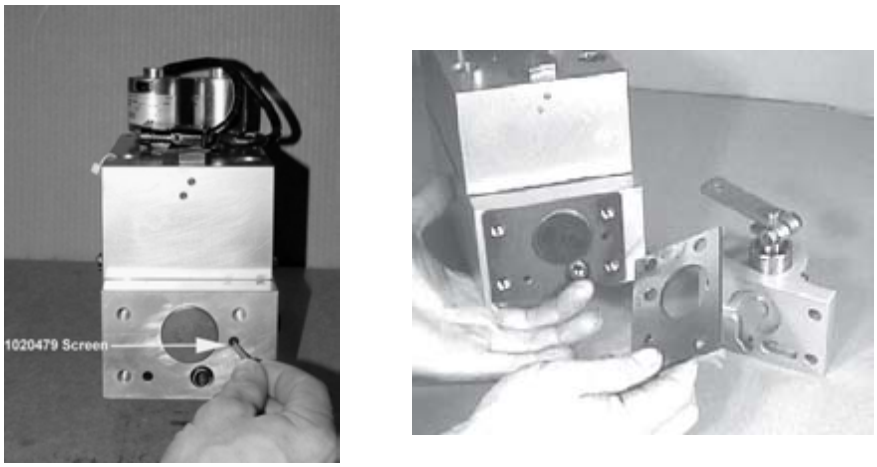


Figure 205. Installing Neutral Pressure Regulating Spring and Ball

17. Install the orifice plate gasket, orifice plate, trolling valve gasket, and trolling valve onto the control valve. Install the attaching screws and torque them to 23 N•m (17 ft•lb).

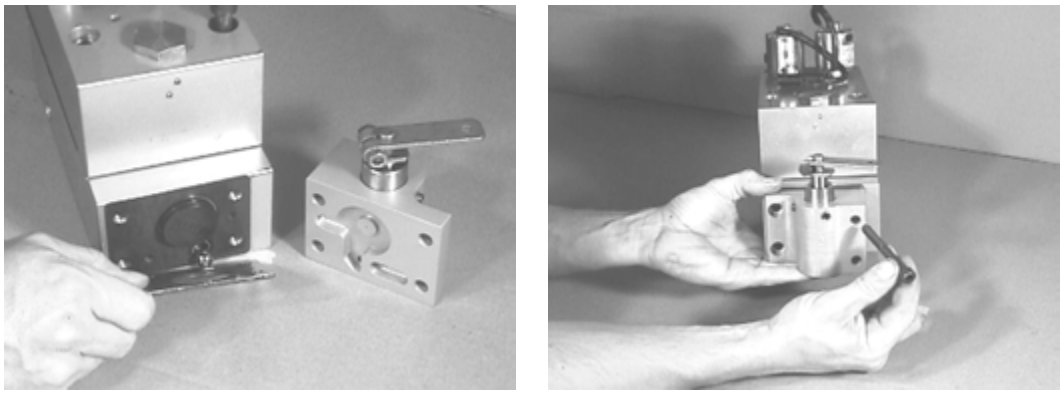


Figure 206. Installing Orifice Plate (left) and Trolling Valve Onto Valve Body (right)

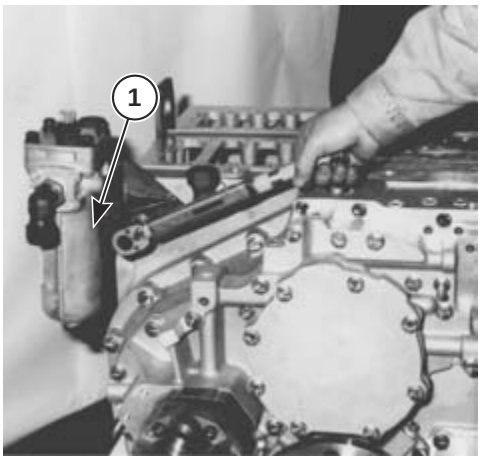
Oil Filter and Piping

1. Install the oil filter assembly (1) onto the transmission.

2. Install the piping assemblies on the transmission.

   a. Pump to filter.
   b. Filter to transmission housing.
      with trolling valve.
   c. Ditch plate to valve (no trolling valve installed). Intall hose if equipped with trolling valve.

   Note: See specification section for tubing and banjo fitting torque values.



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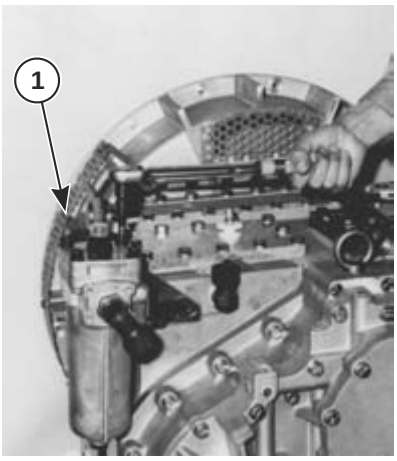

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Figure 207. Oil Filter Assembly (1) and Piping Installation

Torsional Coupling Installation and Fill Transmission with Oil

1. Install the torsional coupling on the input drive hub.

⚠ IMPORTANT

Liquid sealant must cure for a minimum of 24 hours prior to contact with oil.

2. Fill the transmission with oil before operation.

NOTES

Installation

Prior to Installation

⚠ CAUTION

Most Twin Disc products mount directly onto the flywheel of the engine, or are attached to the flywheel through external shafting or adapters. Flywheel-to-driven component interference is possible due to mismatch of components or other reasons. Therefore, engine crankshaft endplay as well as flywheel alignment checks must be made before the driven component is installed.

After installation of the driven component, the crankshaft endplay should be measured again. The endplay at the second measurement should be the same as the first. A difference in these two endplay measurements could be an indication of interference. Consequently, the driven component should be removed and the source of interference found and corrected.

Twin Disc will not be responsible for system damage caused by engine to Twin Disc component interference regardless of the cause of interference. This engine crankshaft endplay check is considered mandatory.

The transmission housing flange and pilot, the engine flywheel and the flywheel housing must be checked for trueness. Clean the engine flywheel and flywheel housing mounting surfaces thoroughly before any measurements are made.

Note: To isolate engine vibration and prevent transferring it to the hull through the propeller shaft, the distance from the marine gear output flange to a fixed stuffing box or the first fixed bearing must be a minimum of 20 times the shaft diameter. If the distance is less than this, a flexible coupling may be necessary to isolate the engine vibration.

Alignment (also reference SAE J-1033 and J-617)

1. Bolt a thousandths increment dial indicator or gauge to the engine flywheel so that the indicator is perpendicular to the face of the engine flywheel housing, and the indicator stem is riding on the face of the flange.

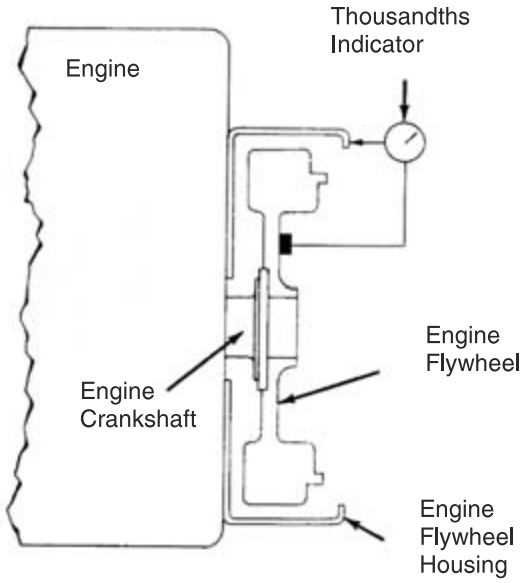


Figure 208. Checking Flywheel Housing Flange for Deviations

2. Rotate the engine flywheel, always keeping a thrust in the same direction, and note the face deviation of the engine flywheel-housing flange. The face deviation must not exceed the figures given in Table 9.

Table 9. Total Indicator Readings for Engine Flywheel Housing Flange

SAE Housing Number	Face Deviations and Bore Eccentricity mm (in)
00	0.48 (0.019)
0	0.41 (0.016)
1/2	0.36 (0.014)
1	0.30 (0.012)
2	0.28 (0.011)
3	0.25 (0.010)
4	0.23 (0.009)
5	0.20 (0.008)
6	0.18 (0.007)

3. With the indicator mounted as in the previous paragraph, adjust the indicator stem so that it will ride on the bore of the engine flywheel housing.

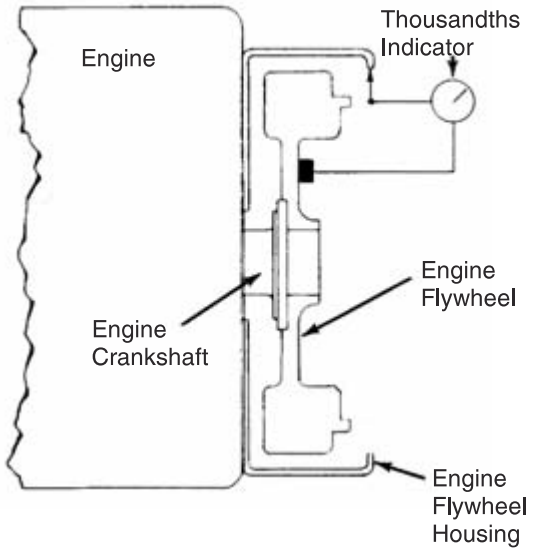


Figure 209. Checking Flywheel Housing Bore Eccentricity

4. Rotate the engine flywheel and note the bore eccentricity of the engine flywheel-housing bore. See the previous Table for allowable tolerances.

5. Bolt a thousandths dial indicator or gauge to the engine flywheel housing so that the indicator is perpendicular to the engine flywheel, and the indicator tip is riding on the inner face of the flywheel. Rotate the flywheel. The variation of the face runout of the surface to which the driving ring is bolted should not exceed 0.013 mm (0.0005 in) per inch of diameter.

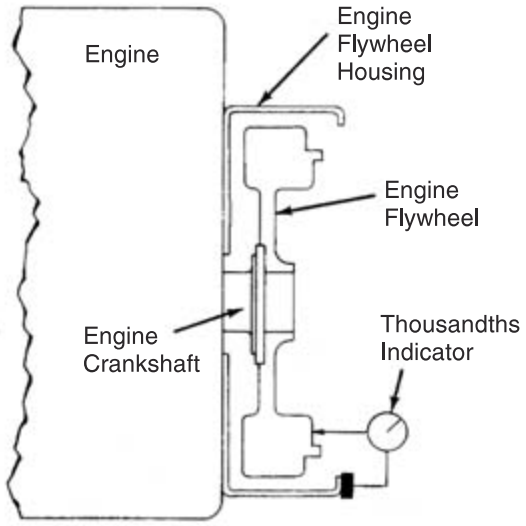


Figure 210. Checking the Flywheel Face Runout

6. With the indicator mounted as in the paragraph above, adjust the indicator tip so that it will ride on the driving ring pilot bore of the engine flywheel. Rotate the flywheel. The driving ring pilot bore eccentricity of the engine flywheel should not exceed 0.13 mm (0.005 in) maximum total indicator reading. Thrust on the flywheel should be in one direction at all times to obtain a correct reading.

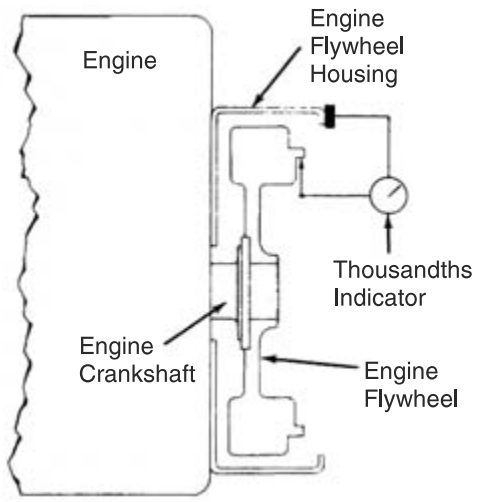


Figure 211. Checking the Flywheel Pilot Ring Bore Eccentricity

Installation

Alignment

Proper alignment of an engine and marine unit is critical, both during the initial installation and at frequent intervals during the life of the boat. It is rather common for a boat to change its form with various loads and with age. Engine and shaft alignment can also change on a boat due to varying loads and the boat's age. The following steps may be taken to secure proper marine transmission alignment.

When reinstalling a marine gear after a repair, or when installing a new marine gear to an engine already mounted in the bed rails, the flywheel housing should be checked for deflection using the following procedure:

1. Install the mounting brackets on the side mounting pads of the marine gear.
2. Install the driving ring on the engine flywheel. Bolt an indicator to the engine block and set the indicator stem on the engine flywheel housing.

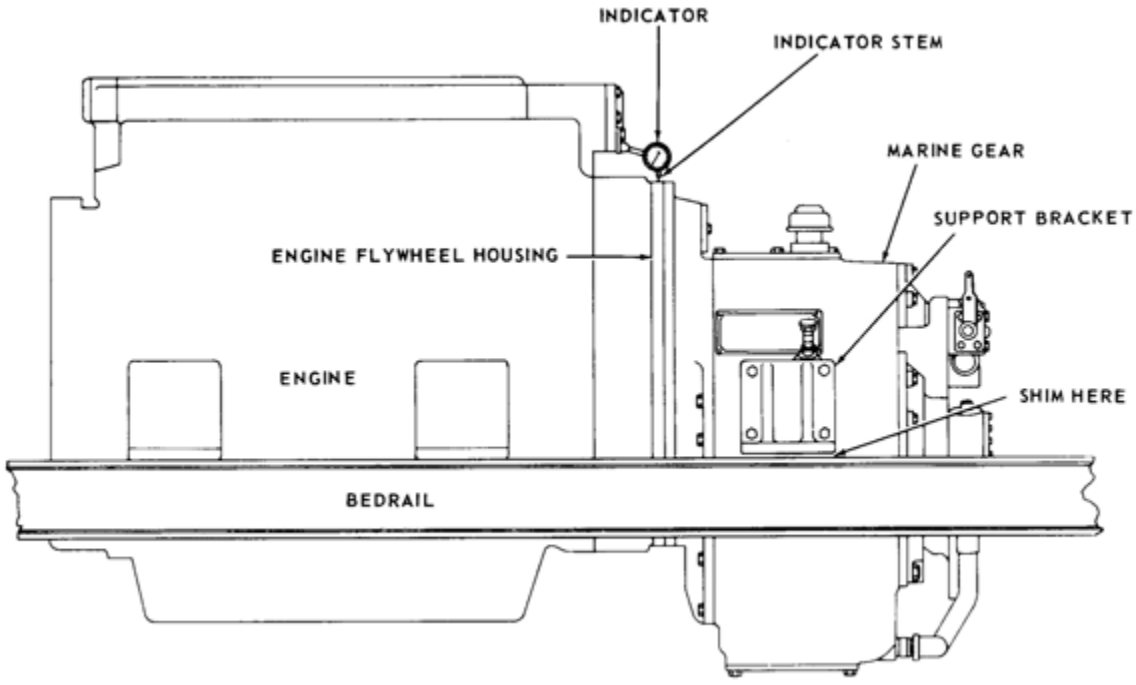


Figure 212. Marine Gear Alignment

3. Set the indicator gauge at zero (0).
4. Lift the marine gear with a hoist, or other suitable means, and place the unit in position against the engine flywheel housing.
5. Secure the flange of the marine gear main housing to the engine flywheel housing.
6. Use a feeler gauge between each mounting bracket and engine bed rail. Add shims between the brackets and bed rails to equal the feeler gauge readings.
7. Carefully release the lifting force on the marine gear while observing the indicator. The indicator gauge must remain steady at the zero mark.
8. Torque the bed bolts to the proper rating. If the reading moves from zero, lift the marine gear and insert additional shims. Continue this procedure until the marine gear is completely at rest on the bed rails and the gauge maintains a steady zero reading.
9. After obtaining the correct zero reading, indicating no distortion of the engine flywheel housing, secure the mounting brackets to the engine bed rails. Before securing the mounting brackets to the engine bed rails, the propeller shaft should be checked for alignment.

Note: The transmission output flange and companion flange bolts must be torqued to the proper value as identified in Description and Specifications.

Torsional Input Coupling Alignment - Free Standing Units

Alignment of freestanding transmissions must begin by aligning the transmission output flange to the propeller shaft. The engine must then be moved to properly align the engine flywheel to the transmission input hub.

Engine and Marine Transmission Alignment

⚠ CAUTION

When mounting the engine and transmission in the boat, all of the mounting pads on both the engine and transmission must be used. Failure to do so may result in damage to the transmission or the engine flywheel housing.

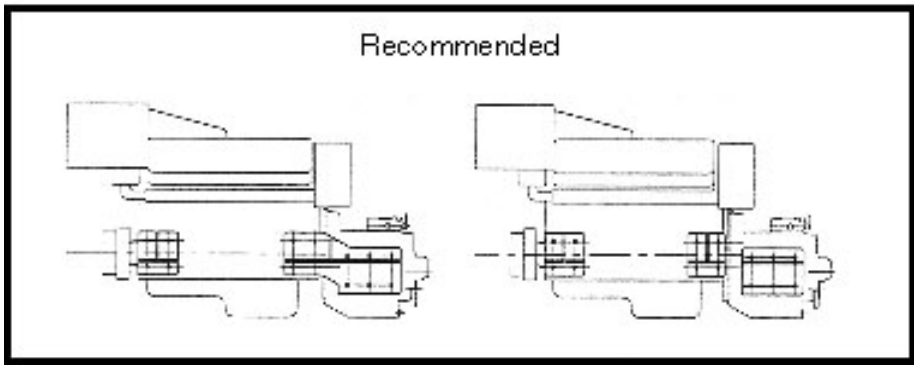


Figure 213. Recommended Transmission Mounting Configurations

When mounting the engine and transmission in the boat, all of the mounting pads on both the engine and the transmission must be used. Failure to do so may result in damage to the transmission.

It is important to align the engine and transmission only when the boat is afloat, and NOT in dry-dock. During this alignment period, it is also advisable to fill the fuel tanks and load the boat in the typical manner that it is to be used. Some boats are built with flexibility and may change shape as the loading varies.

When a heavy boat is dry-docked, it naturally undergoes some bending. Therefore, it is always good practice to unbolt the marine transmission coupling to prevent bending of the shaft.

With the engine and transmission in position on the engine bed, arrangements must be made to have a controlled lifting or lowering of each of the four corners of the engine. If threaded holes are provided in each of the engine mounts, jacking screws can be used in them. The engine can be raised by screwing down, or lowered by backing off on the jacking screws to obtain the desired adjustment.

Steel plates must be inserted under the jacking screws so that the bolts will not damage the engine bed. Lifting can also be accomplished by the use of chain hoists or properly placed jacks. Adjustable shims also are available and can simplify the alignment process, particularly for future realignment.

It may also be necessary to move the engine and transmission to one side or the other on the engine bed to obtain horizontal alignment. This can be done with a jack placed horizontally between the engine and the foundation. At the same time, a straight edge is laid across the edges of the flanges at the top and side to check the parallel alignment of the coupling edges.

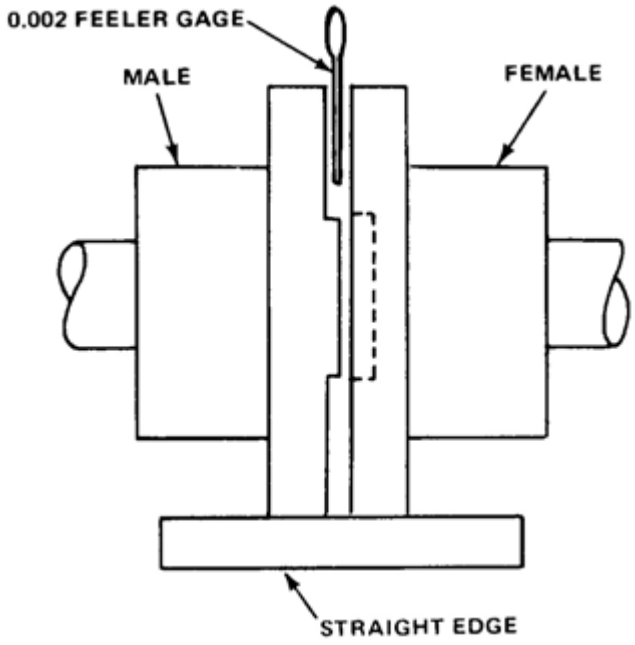


Figure 214. Checking Parallel Alignment of the Coupling

As the engine and marine transmission come into their aligned position, it will be possible to mate the output flange and propeller coupling, and prepare for bolting together. Care should be taken not to burr or mar this connection because the fit is very critical. Place a 0.05 mm (0.002 in.) feeler gauge between the flanges of the coupling. Move (slide) the feeler gauge completely around the coupling. Rotate the marine transmission flange coupling in 90 degree increments, and move the feeler gauge around the flange in each successive position. The feeler gauge will fit snugly, with the same tension, all around the flange coupling in all four positions if the alignment is correct.

If the alignment varies during rotation, additional alignment is necessary, or the marine transmission and shaft couplings should be checked for proper face runout. Runout must not exceed 0.10 mm (0.004 in.) Excessive face runout on the marine transmission output flange can usually be corrected by repositioning the coupling on its spline or taper. Excessive shaft coupling runout is usually due to inaccuracy of the taper fit or key to keyway interference. The optimum relative mating location will be where the measured runout dimensions of the transmission flange and the shaft coupling flange compliment each other to result in the least relative out of true parallel measurement.

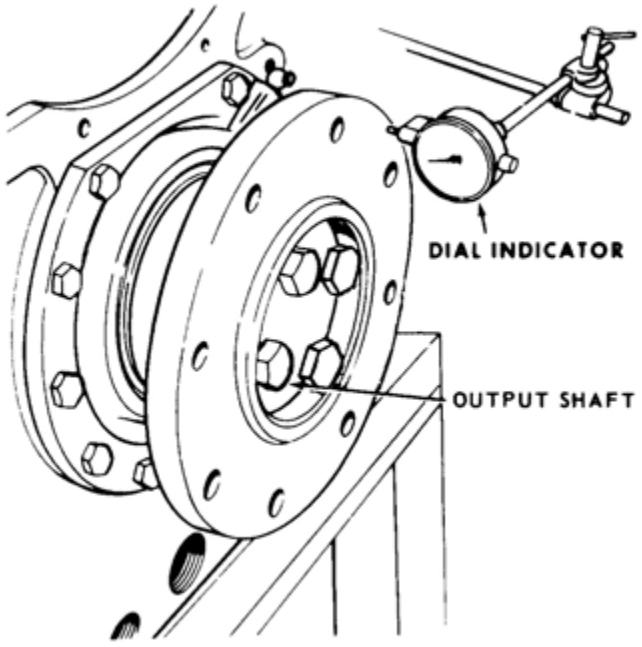


Figure 215. Checking Output Flange Face Runout

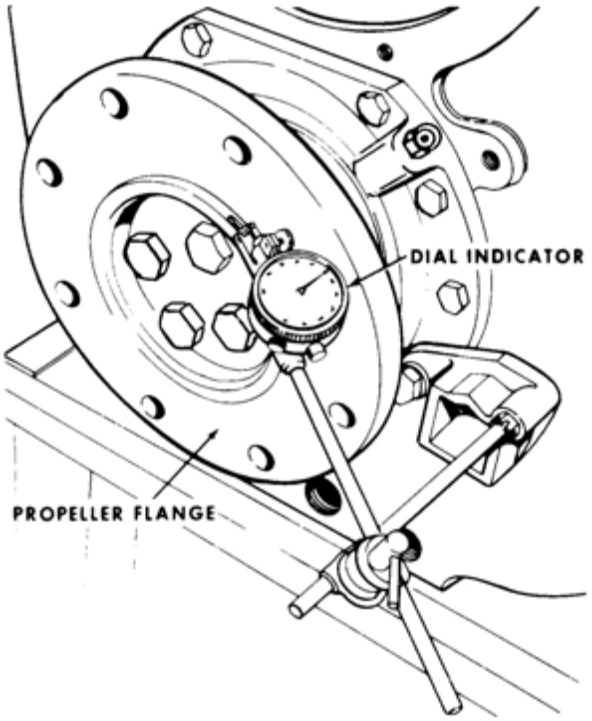


Figure 216. Checking Output Flange Pilot Eccentricity

Some boats are not structurally rigid and some carry their load in such a way that they will “hog” or go out of normal shape with every loading and unloading. Where this condition exists, it important to apply common sense alignment techniques to minimize the potential damage to any of the components.

During the process of securing final alignment, it may be necessary to shift the engine many times. When the final alignment is accomplished, mark and drill the holes for the lag studs or locating dowel pins. Then with final alignment secured, make up the necessary poured, steel, or hardwood shims, and fasten the engine and transmission in place. Then recheck the alignment, and if satisfactory, bolt the coupling together.

There are many types of flexible couplings in the market today that solve a variety of problems:

- ❑ Couplings to reduce noise and vibration.
- ❑ Couplings to allow a permanent angular misalignment.
- ❑ Couplings that allow engines to be flexibly mounted and take out the momentary misalignment.

In some cases, the proper alignment of these couplings requires an accuracy equal to that of rigid couplings. Always use the alignment procedures recommended by the coupling manufacturer.

Propeller Shaft

Before any attempt to align the engine and gearbox to the propeller shaft, proper alignment of the propeller shaft must be determined. This includes alignment of the propeller shaft through all struts and intermediate bearings. Failure to properly align the propeller shaft may result in premature wear on bearings, vibrations, or possible damage to other components.

If the length of the shaft from the last support bearing to the gearbox is excessive or a flexible stuffing box is used, the shaft must be centered prior to engine and gearbox to propeller shaft alignment.

Transmission Controls

⚠ CAUTION

Transmission controls must be checked for proper function and alignment after any transmission selector valve is properly indexed in relation to the operator's control lever. Failure to do so could cause control system malfunction, resulting in personal injury and or damage to equipment and property.

See specific marine transmission installation drawings for detail and dimensional information needed for the proper installation of control linkages, power engaging devices, or electrical connections.

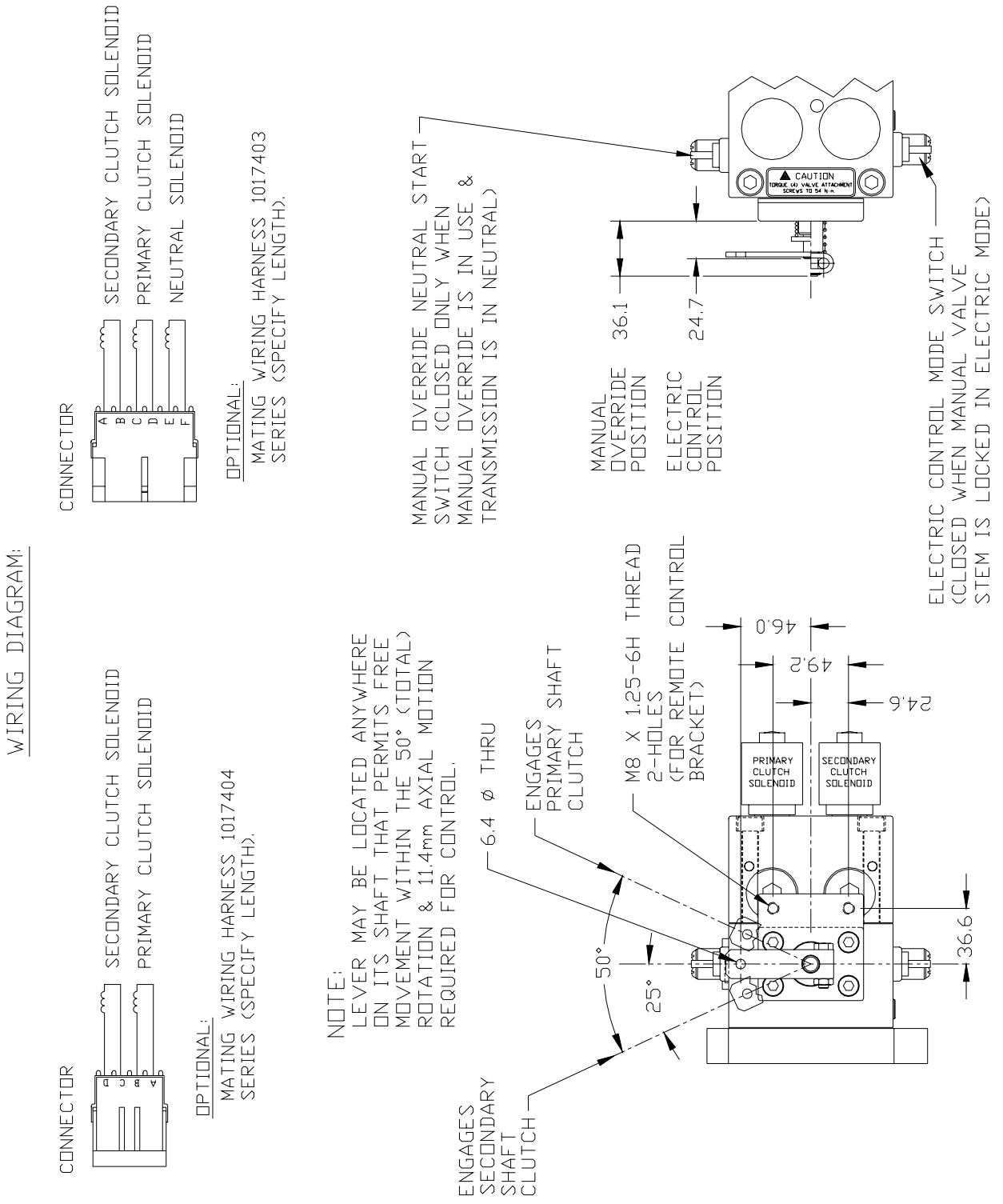


Figure 217. Electric Control Valve Installation Specifications

Mechanical Controls

If the manual override valve is connected to a control cable or device, movement of the operator's selector lever to the forward, neutral or reverse position must result in the transmission control valve selector being positioned in the forward, neutral or reverse detent location. Cables and linkages must be supported properly and not have any excessive slack that will allow relative movement between the operators selector lever and the transmission control valve selector lever.

Power Controls

Selector valve positioning devices must be installed so that full travel of the actuating cylinder places the transmission selector valve in the detent position for forward or reverse, as selected, without exerting pressure on the rotational stop on the selector valve stem. Selecting Neutral must place the selector valve in the Neutral detent position. Improper installation of power engaging devices could cause failure of the selector valve stop permitting improper positioning of the selector valve and resulting in control malfunction.

Electrical Controls

All electrical wires and connectors must be adequately supported to prevent rubbing, chafing, or distress from relative movement. All electrical connections must be tight and free from any corrosion.

Final Checks

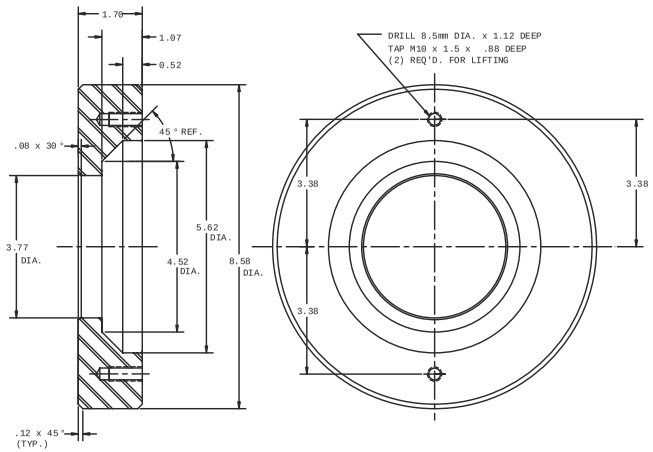
Be sure the transmission is filled with oil before starting. See Description and Specifications and Preventative Maintenance for proper oil and filling procedure.

Special Tools

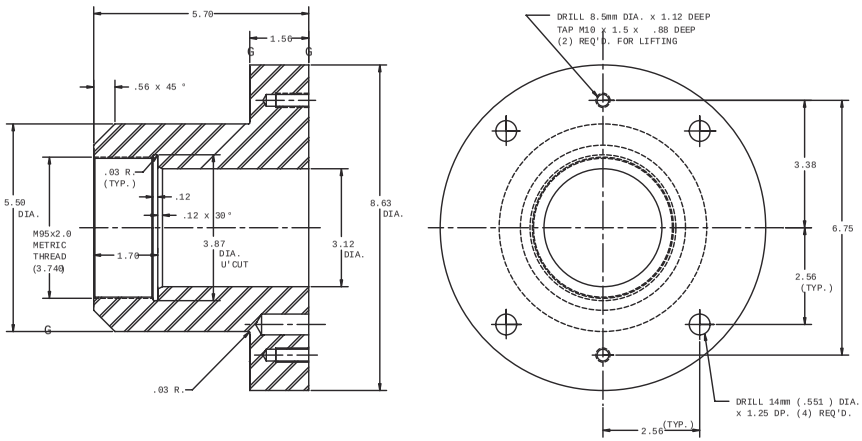
List of Special Tools

The following pages include the special tool drawings that are specific to this model. The special tool drawings included are listed below and continued on the following page.

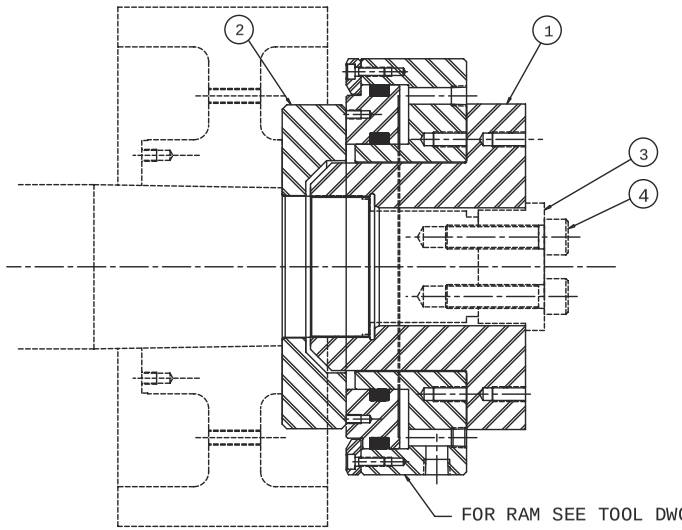
- ❑ T-21482-1 Output Shaft to Bull Gear Puller
- ❑ T-21482-2 Gear to Shaft Ram
- ❑ T-21482-6 Retention Block and Screw
- ❑ T-21482-7 Bearing Driver
- ❑ T-21482-8 Hydraulic Knock-out Tool
- ❑ T-21482-13 Locating Plate
- ❑ T-21482-15 Output Gear Retaining Tool
- ❑ T-21482-16 Manifold Sleeve Removal Tool
- ❑ T-21482-17 Trailing Pump Gear Shaft & Bearings Removal Tool
- ❑ T-21482-18 Hydraulic Pressure Adapter
- ❑ T-21482-19 Output Shaft Pusher
- ❑ T-21482-20 Bearing Driver
- ❑ T-21482-26 Bearing Driver
- ❑ T-21482-30 Bearing Driver
- ❑ T-21482-37 Output Shaft Screw Removal Tool
- ❑ T-21482-39 Leg Support Bracket
- ❑ T-21482-45 Bearing Driver
- ❑ T-21578-4 Output Seal Carrier Retainer



(2) RAM BASE (1) R EQ'D.
MAT. : 4140 (HDN. & GRD.)



(1) RAM SUPPORT (1) REQ'D.
MAT. : 4140 (HDN. & GRD.)



FOR RAM SEE TOOL DWG.
T-21482-2 HYD. RAM

(4) (4) REQ'D. SOC. HD. CAP SRC. USE PRODUCTIO N LINE STOCK
(3) (1) REQ'D. RETAINER - SHAFT USE PRODUCTIO N PART
(2) (1) REQ'D. RAM SUPPORT
(1) (1) REQ'D. RAM BASE

USE WITH T-21482-2 H YD. RAM

NOTE :
UNLESS OTHERWISE SPECIFIED,
BREAK ALL SHAR P CORNERS

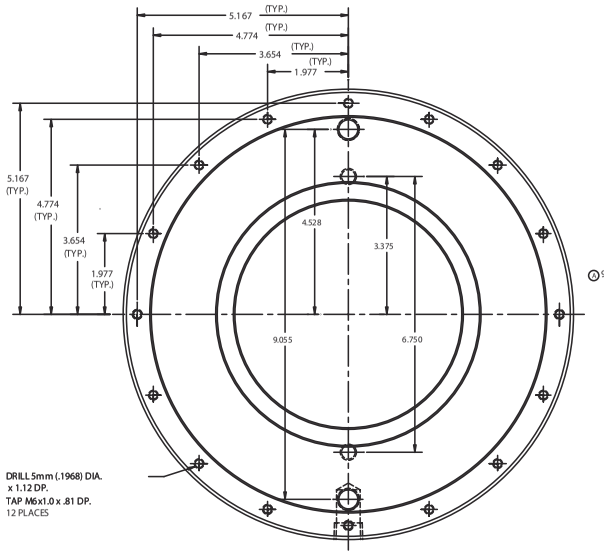
NOTE :
ALL GRD. DIA'S. & SURFACES MUST B E
SQUARE & CONCE NTRIC TO WITHIN
.005 OF EACH O THER

4	4	STD	SOC. HD. CAP SRC.	USE PRODUCTION LINE	STK.
3	1	STD	RETAINER - SHAFT	USE PRODUCTION PART	
2	1	4140 (HDN. & GRD.)	RAM SUPPORT	8.75 DIA. x 6.00 THICK	
1	1	4140 (HDN. & GRD.)	RAM BASE	8.75 DIA. x 2.00 THICK	
DET	REQ	MAT	DESCRIPTION	STOCK SIZE	

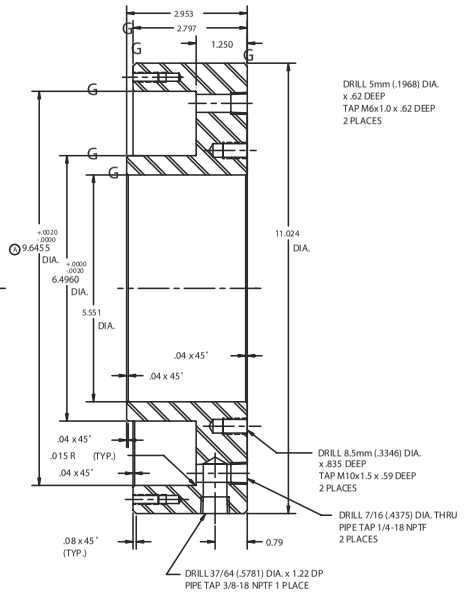
DATE: 9-12-97 BY: JPL F.P.N.: Scale: FULL
NAME: OUTPUT SHAFT TO BULL GEAR PULLE R
TYP: MG 6619 SHEET OF 1
THIN DISC INC. RACINE, WIS. T-21482 -1

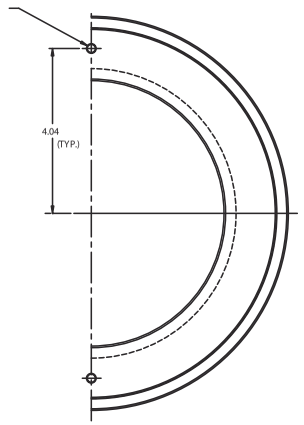
CHANGE	DESCRIPTION	DATE	BY

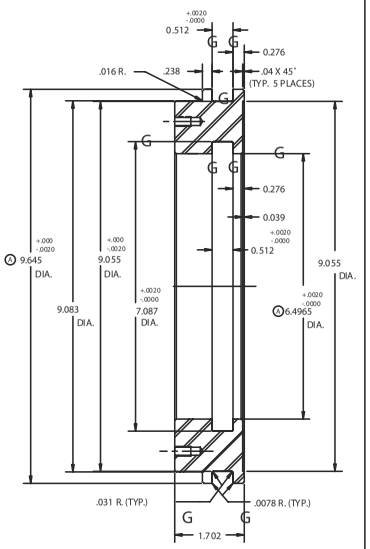
CAD FILE : 21482-1



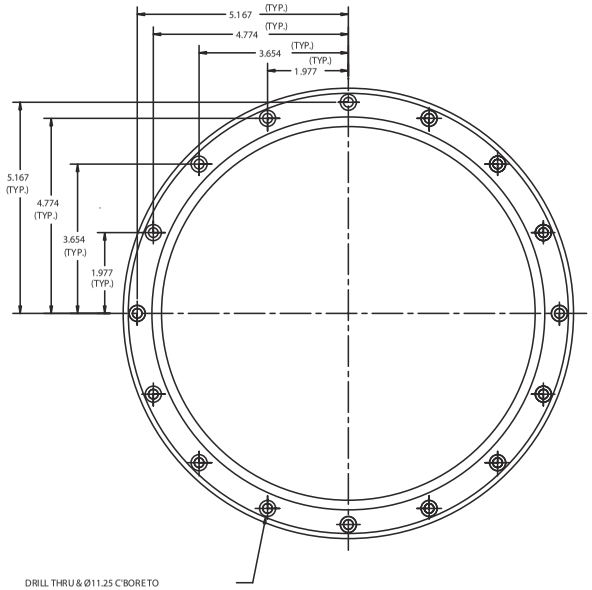
1 PISTON BODY (1) REQ'D.
Ⓐ MAT.-TS PREHARD Rc 28-32

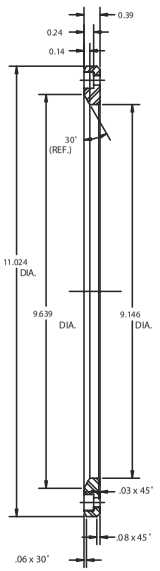




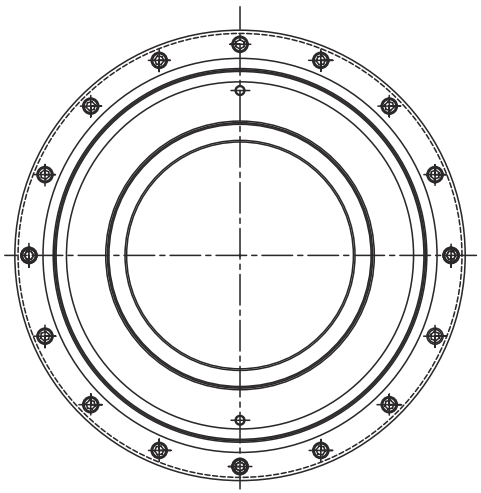


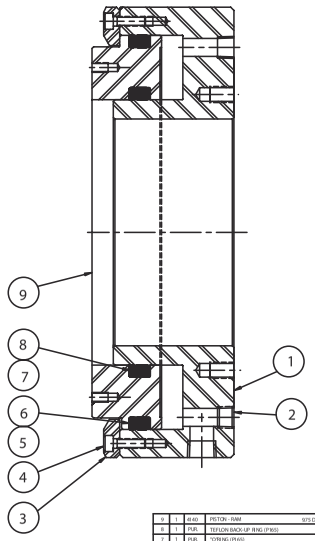
9 PISTON RING (1) REQ'D.
Ⓐ MAT.-TS PREHARD Rc 28-32





3 PISTON RETAINER (1) REQ'D.
Ⓐ MAT.-TS PREHARD Rc 28-32





Ⓐ NOTE : STAMP
"MAXIMUM OPERATING PRESSURE = 7250 PSI"
IN O.D. OF DETAIL# 1 WITH MINIMUM 1/4 INCH HIGH LETERING

NOTE : UNLESS OTHERWISE SPECIFIED,
BREAK ALL SHARP CORNERS

NOTE : ALL GRD. DIA'S. & SURFACES MUST BE
SQUARE & CONCENTRIC TO WITHIN
.001 OF EACH OTHER

ITEM	QTY.	REQ'D.	MAT.	DESCRIPTION	STOCK SIZE
9	1		4140	PISTON - RAM	9.75 DIA. x 1.50 THK.
8	1		PUR.	TEFLON BACK-UP RING (P165)	
7	1		PUR.	"O"RING (P165)	
6	1		PUR.	TEFLON BACK-UP RING (T220)	
5	1		PUR.	"O"RING (P230)	
4	16		STK.	SOC. HD. CAP SCREW- METRIC	M6x1.0x20mm LG.
3	1		4140	PISTON RETAINER	11.25 DIA x .50 THK.
2	2		STK.	PIPE PLUG (SQ.HD.STK)	1/4-18 NPTF
1	1		4140	RAM - BODY	11.25 DIA. x 3.25 THK.

Date: 8-30-97 By: JPS Ø FIN: Scale: FULL

NAME: RAM - GEAR TO SHAFT

FOR: MG 6000

SHEET OF 1 1

T-21482-2

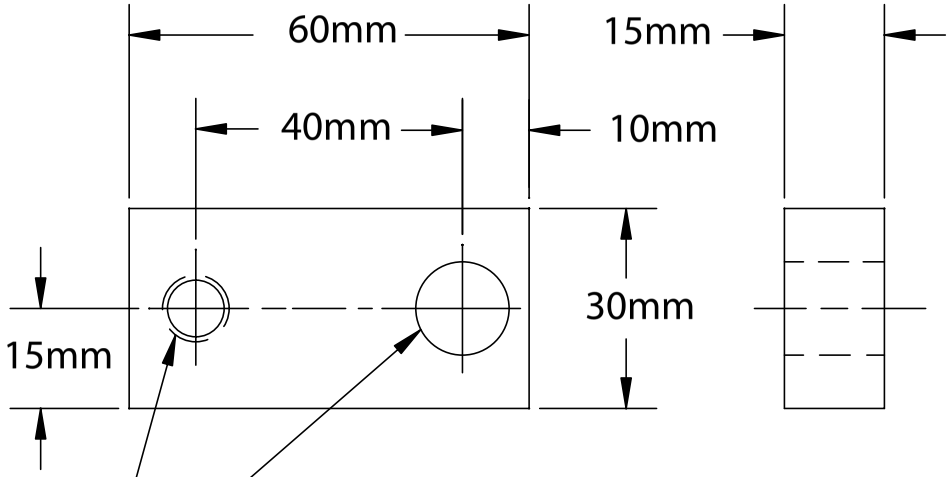
REV	DESCRIPTION	DATE	BY
A	UPDATE PRINTPERFENG. REQUEST	11.20.2000	TMV

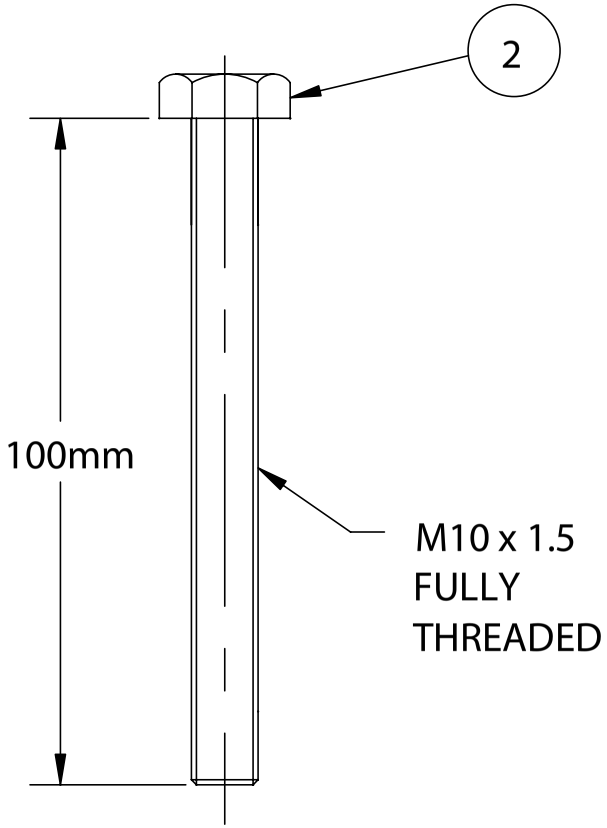
TWINDISC INC RACINE, WIS.

T-21482-2
MG 6000

CAD FILE : T-21482-2.DWG

CHG	DESCRIPTION	DATE	BY





1 PULLER BLOCK (2) REQ'D.
MAT. : M.S.
SIZE : .62 x 1.25 x 2.50 LONG

2 NOTE : MAKE FROM
HEX HEAD CAP SCR.
PROPERTY GR. 8.8
(2) REQ'D. - USE
ON ALL MODELS

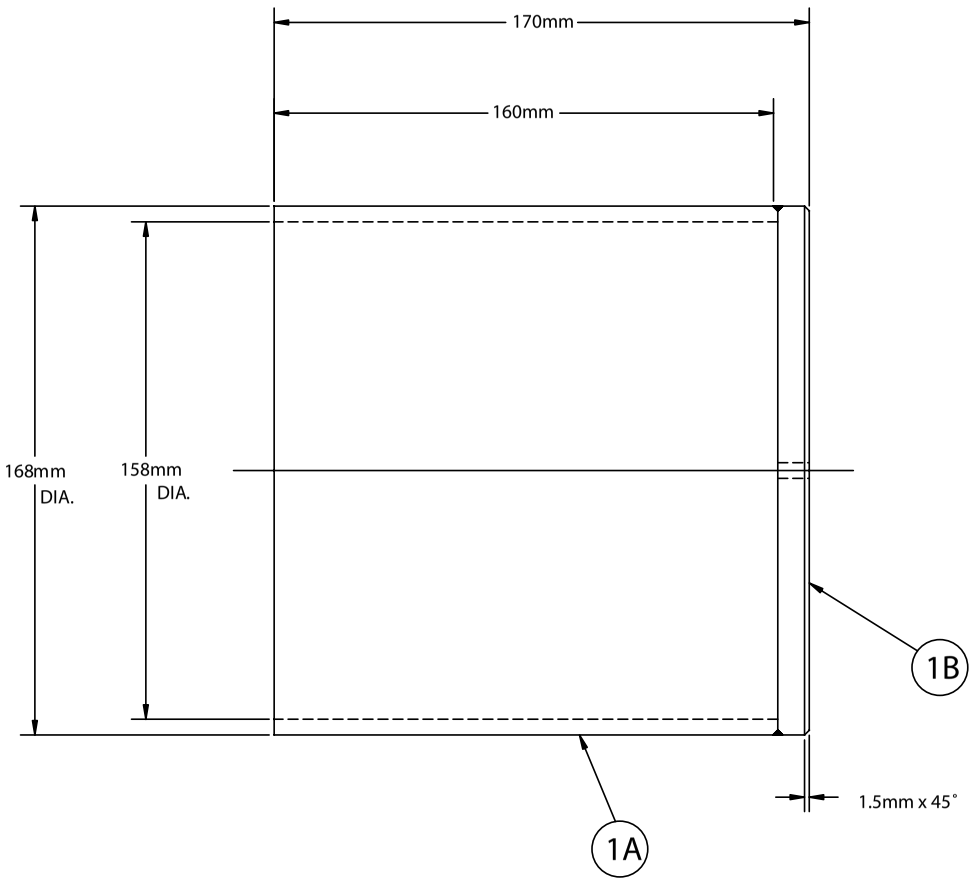
CAD FILE : 21482-6

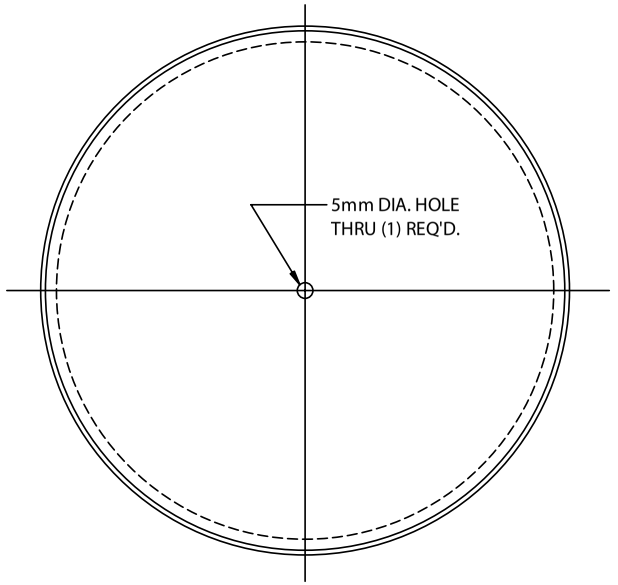
FOR MG 6557, MG 6619 & MG 6600 MODELS

TWIN DISC, INC.	RETENTION BLOCK AND SCREW	JPL	12-13-97	PART NO: T-21482-6

576022

FORM 1390A





1 WELDMENT (1) REQ'D.

1A STEEL TUBING (1) REQ'D.
6.75 O.D. x .25 WALL x 6.38 LG.

1B COVER - TAP (1) REQ'D.
6.38 DIA. x .38 THICK

CHANGE	DESCRIPTION	DATE	BY

DET.	REQ.	MAT.	DESCRIPTION	STOCK SIZE
Date: 12-15-97		By: JPL	F.P.N.:	Scale: FULL

NAME BEARING DRIVER

FOR MG 6600 DC
MG 6619 SC

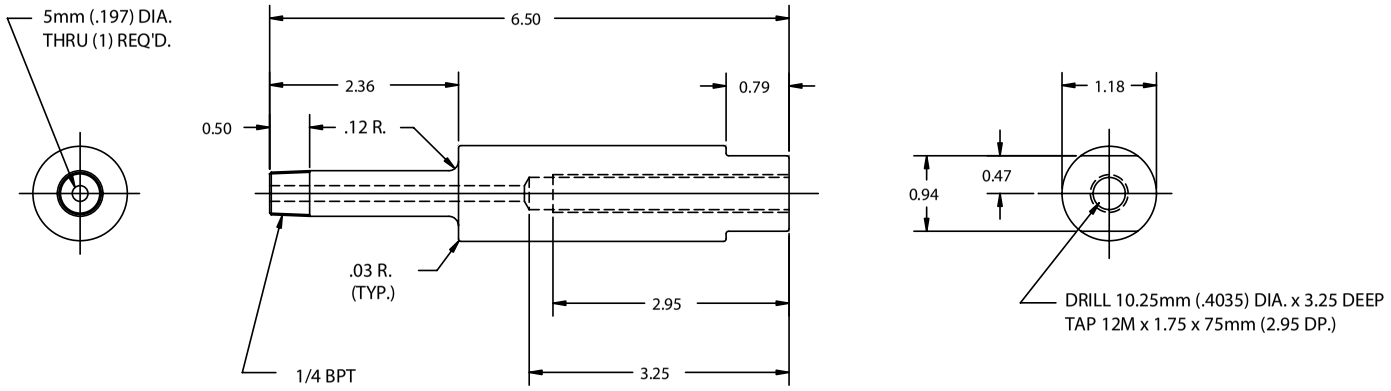
SHEET OF 1 1

TWIN DISC INC. RACINE, WIS.

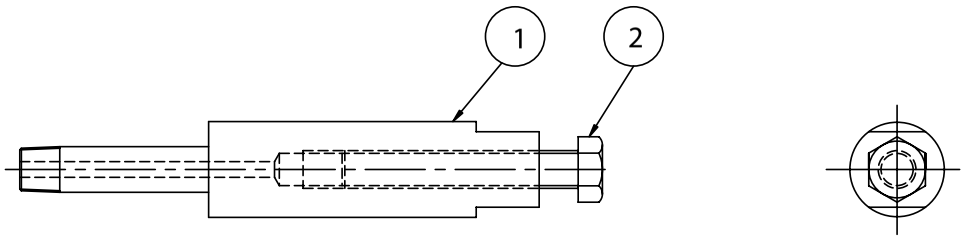
T-21482-7

STAMP TOOL NO.: T-21482-7
PART NO.: MG6600 DC & MG6619 SC
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
.001 ON THREE PLACE DECIMAL DIMENSION
.01 ON FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 ON ANGULAR DIMENSION

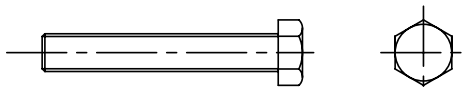
CAD FILE : 21482-7



1 HYDRAULIC KNOCK-OUT TOOL
MAT. : M.S. (1) REQ.D



HYDRAULIC KNOCK-OUT TOOL
WITH M12x1.75 FULLY THREADED BOLT



2 M12 x 1.75 x 75mm LONG
GRADE 8.8 (1) REQ'D.
FULLY THREADED

MG 6600 SERIES
MG 6619 SERIES
MG 6557 SC & MG 6557 A

STAMP TOOL NO.: T-21482-8
PART NO.:
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
.001 ON THREE PLACE DECIMAL DIMENSION
.010 ON FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 ON ANGULAR DIMENSION

CAD FILE : 21482-8

GRADE 8.8 METRIC

DET.	REQ.	MAT.	DESCRIPTION	STOCK SIZE
2	1	STK.	METRIC HEX BOLT	M12 x 1.75 x 75mm LG.
1	1	M.S.	KNOCK-OUT TOOL	1.25 DIA. x 6.75 LG.

Date: 1-9-98 By: JPL F.P.N.: Scale: FULL

NAME HYDRAULIC KNOCK-OUT TOOL

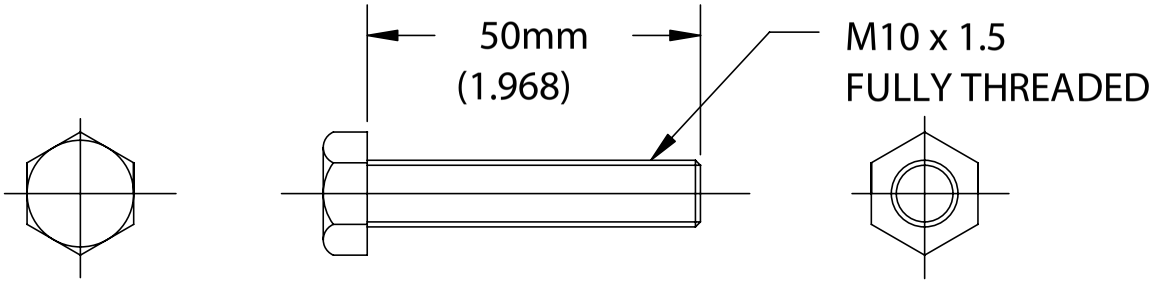
FOR MG 6557SC & MG 6557A
MG 6600 & MG 6619 SERIES

SHEET OF 1 1

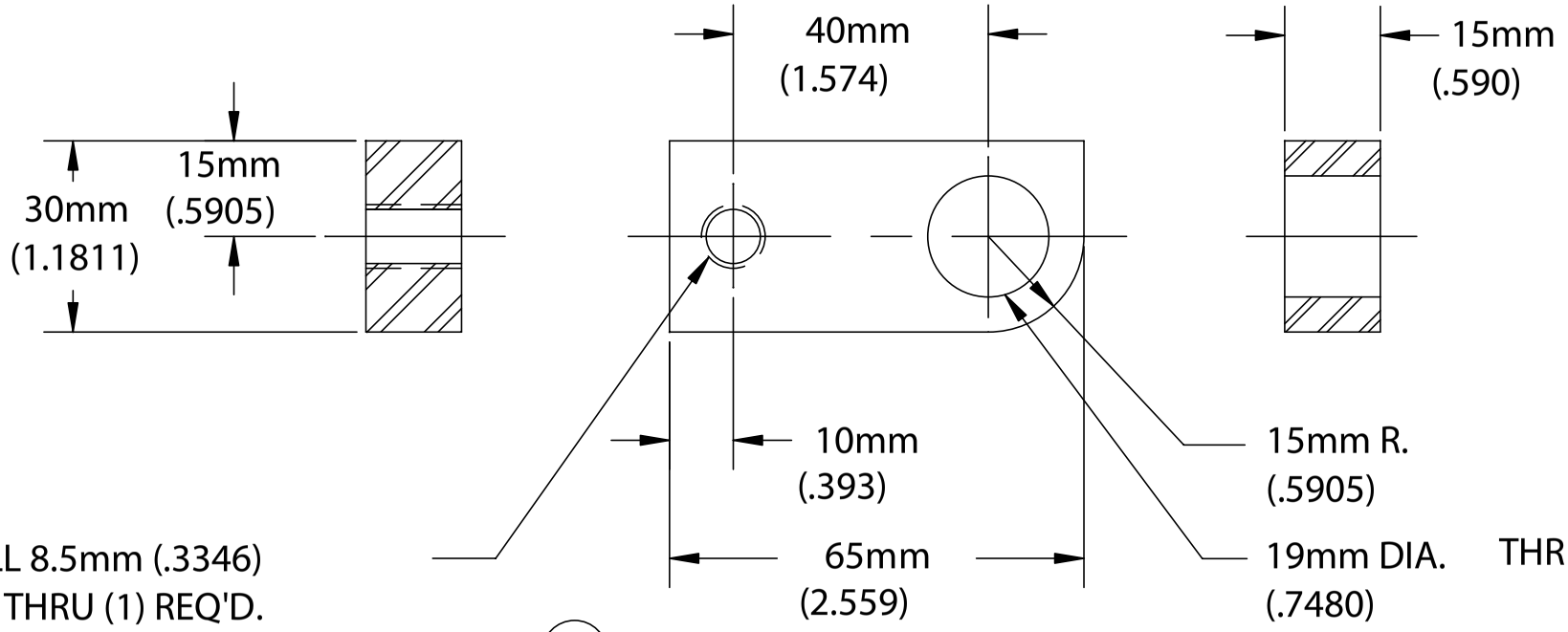
T-21482-8

TWIN DISC INC. RACINE, WIS.

CHANGE	DESCRIPTION	DATE	BY



2 REWORK METRIC HEX HD. SCREW
M10x1.5 THD. TO FULL LEGTH (2) REQ'D



DRILL 8.5mm (.3346)
DIA. THRU (1) REQ'D.
TAP M10 x 1.5 THREAD

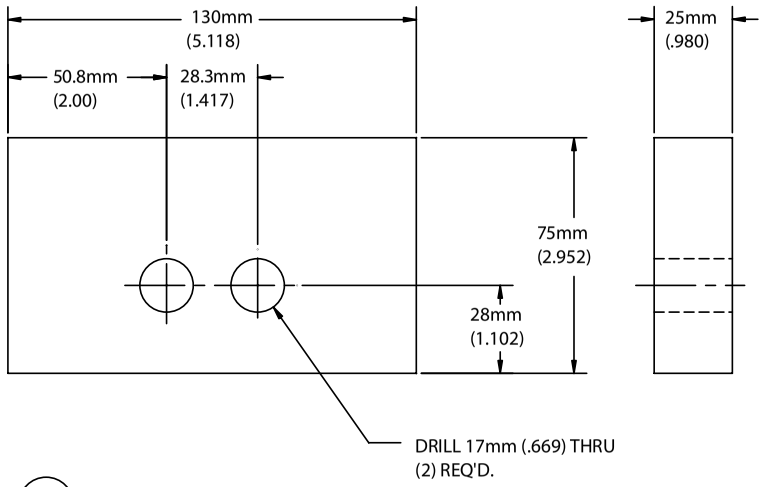
1 LOCATING PLATE _ (2) REQ'D.
MAT. : M.S.

FOR MG 6557 , MG 6619 & MG 6600 MODELS

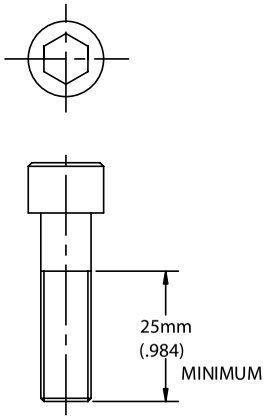
TWIN DISC, INC.	LOCATING PLATE	JPL	1-14-98	PART NO: T-21482-13

576022

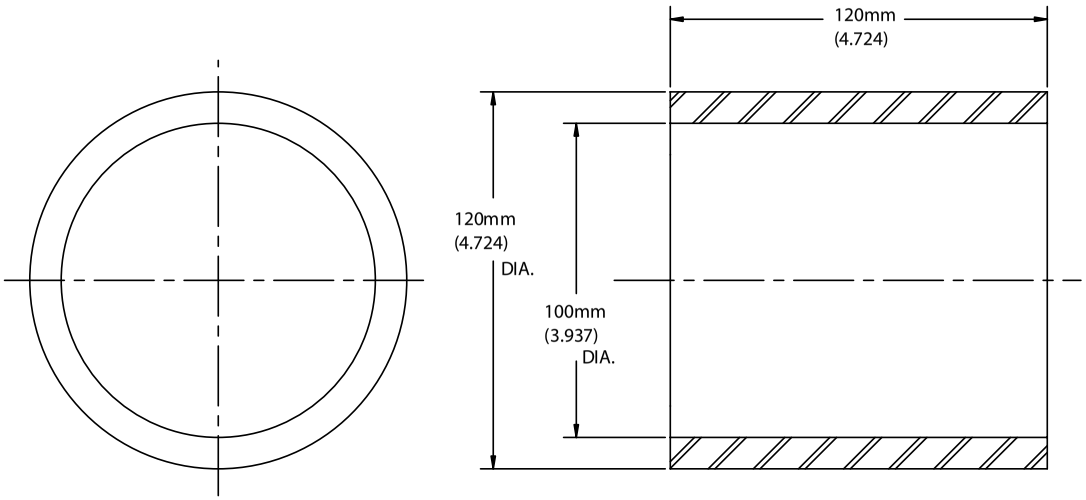
FORM 1390A



2 BASE PLATE (1) REQ'D.
MAT. : M.S.



3 METRIC SOC. HD. CAP SCREW
M16x2.0 x 60mm (2.362)
PROPERTY CLASS 12.9 MINIMUM
(2) REQ'D.



1 OUTPUT TUBE (1) REQ'D.
MAT. : STEEL TUBING

NOTE : UNLESS OTHERWISE SPECIFIED,
BREAK ALL SHARP CORNERS

DET.	REQ.	MAT.	DESCRIPTION	STOCK SIZE
3	2	STK.	SOC. HD. CAP SCREW	M16x2.0 x 60mm LG.
2	1	S.TUBE	TUBE 5.00 O.D. x .62 WALL x 5.00 LG.	
1	1	M.S.	BASE PLATE 25mm (.984)THK. x 3.0 x 5.25	

Date: 1-20-98 | By: JPL | F.P.N.: | Scale: FULL

NAME: OUTPUT GEAR RESTAINING TOOL

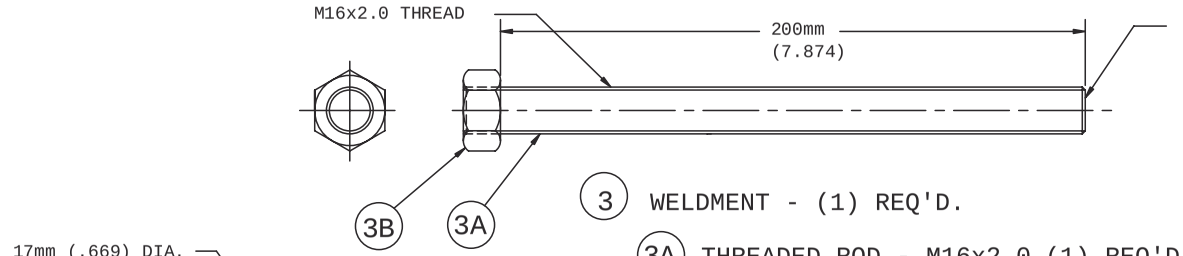
FOR: MG 6619 SC | SHEET OF 1 1

TWIN DISC INC. RACINE, WIS. | T-21482-15

CHANGE	DESCRIPTION	DATE	BY

STAMP TOOL NO.: T-21482-15
PART NO.: MG 6619 SC
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
.001 ON THREE PLACE DECIMAL DIMENSION
.01 ON FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 ON ANGULAR DIMENSION

CAD FILE : 21482-15

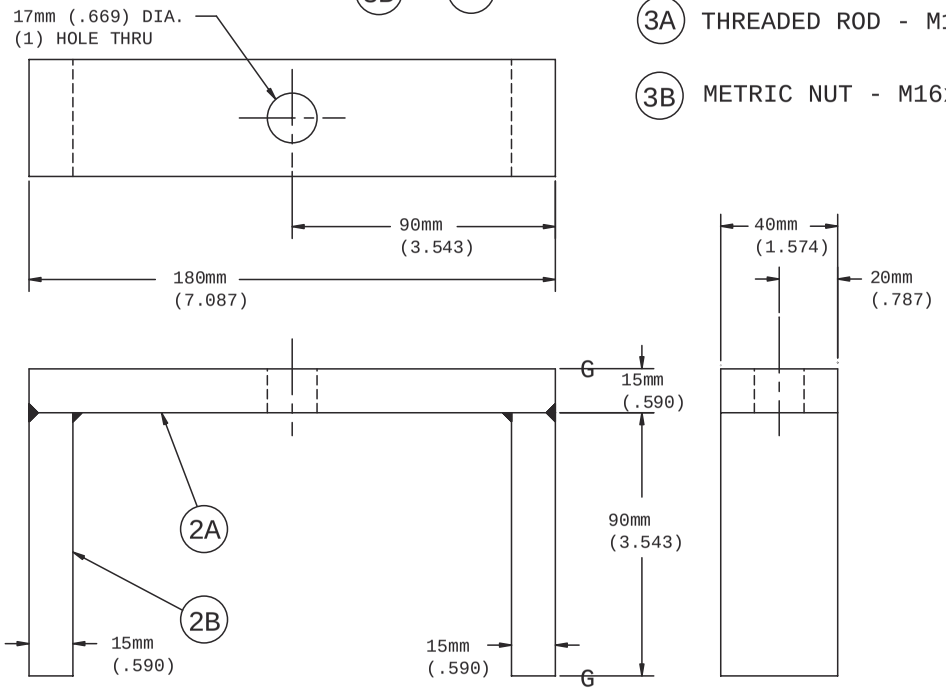


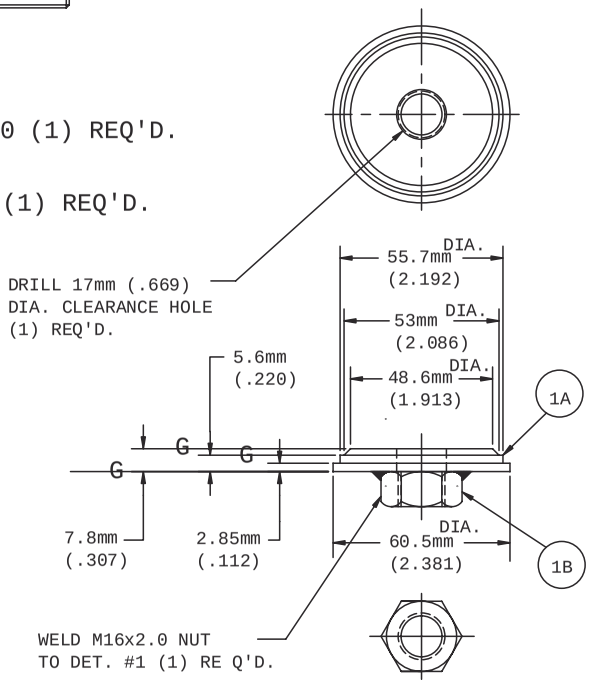
NOTE : THIS WELDMENT IS THE SAM E AS PART OF TOOLS : T-21482-17 & T-21482-19

3 WELDMENT - (1) REQ'D.

3A THREADED ROD - M16x2.0 (1) REQ'D.

3B METRIC NUT - M16x2.0 (1) REQ'D.





1 WELDMENT (1) REQ'D .
MAT. : M.S.

2 SUPPORT WELDMENT (1) REQ'D.

2A TOP PLATE (1) REQ'D.
MAT. : M.S.

2B LEG (2) REQ'D.
MAT. : M.S.

NOTE : UNLESS OTHERWISE SPECIFIE D, BREAK ALL SHARP CORNERS

NOTE : ALL GRD. DIA'S. & SURFACES MUST BE SQU ARE & CONCENTRIC TO WITHIN .005 OF EACH OT HER

DET.	REQ.	MAT.	DESCRIPTION	STOCK SIZE
3B	1	STK.	METRIC THREADED ROD	M16x2.0
3A	1	STK.	METRIC NUT	M16x2.0 x 8.50 LG.
3	1		WELDMENT	
2B	2	M.S.	LEGS 15mm (.590)	x 1.62 x 3.62 LG.
2A	1	M.S.	TOP PLATE 15mm (.590)	x 1.62 x 7.25 LG..
2	1		WELDMENT	
1B	1	STK.	METRIC NUT	M16x2.0
1A		M.S.	BASE RING	2.50 DIA. x 1.00 THICK
1	1		WELDMENT	

Date: 1-22-98 | By: JPL | F.P.N.: | Scale: FULL

NAME MANIFOLD SLEEVE REMOVAL TOOL

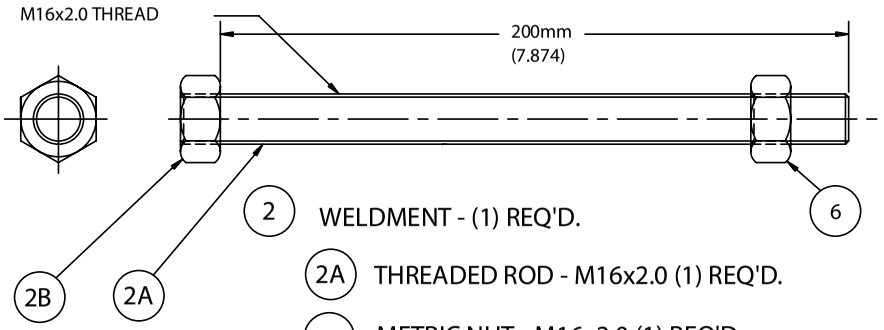
FOR MG 6619 | SHEET 1 OF 1

TWIN DISC INC. RACINE, WIS. | T-21482-16

CHANGE	DESCRIPTION	DATE	BY

STAMP TOOL NO.: T-21482-16
PART NO.: MG 6619
BREAK ALL SHAR P CORNERS
TOLERANCE UNLE SS OTHERWISE SPECIFIED
.001 ON THREE PLACE DECIMAL DIMENSION
.010 ON FRACTION AL AND TWO PL ACE DECIMAL DIMENSION
1/4 ON ANGULA R DIMENSION

CAD FILE : 21482-1 6

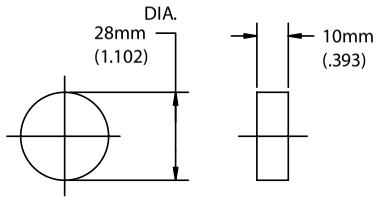


2 WELDMENT - (1) REQ'D.

2A THREADED ROD - M16x2.0 (1) REQ'D.

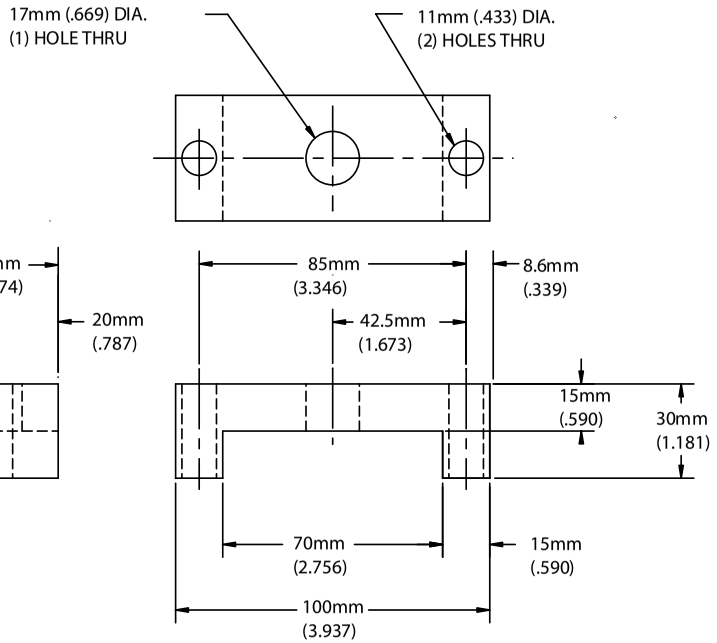
2B METRIC NUT - M16x2.0 (1) REQ'D.

NOTE : THIS WELDMENT IS THE SAME AS PART OF TOOLS : T-21482-16 & 19



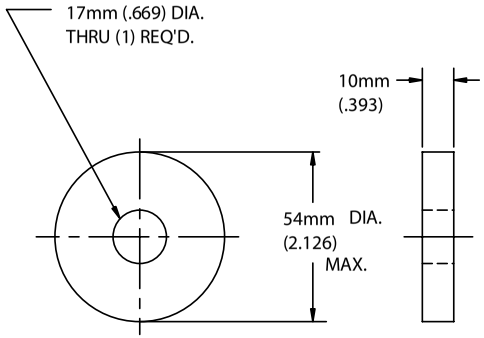
3 PROTECTOR - SHAFT (1) REQ'D.

MAT. : M.S.



1 SUPPORT CLAMP (1) REQ'D.

MAT. : M.S.



4 WASHER - (1) REQ'D.

MAT. : M.S.

NOTE : UNLESS OTHERWISE SPECIFIED, BREAK ALL SHARP CORNERS

DET.	REQ.	MAT.	DESCRIPTION	STOCK SIZE
6	1	STK.	METRIC NUT	M16x2.0
5	2	STK.	SOC. HD. CAP SCREW	M10x1.5 x 50mm LG.
4	1	M.S.	WASHER 2.25 DIA. x 10mm (.393) THICK	
3	1	M.S.	PROTECTOR - SHAFT	2.25 DIA. x 10mm (.393)
2B	1	STK.	METRIC THREADED ROD	M16x2.0 x 8.50 LG.
2A	1	STK.	METRIC NUT	M16x2.0
2	1		WELDMENT	
1	1	M.S.	SUPPORT CLAMP	1.25 x 1.62 x 4.00 LG

Date: 1-24-98 By: JPL F.P.N.: Scale: FULL

NAME REMOVAL TOOL FOR TRAILING PUMP GEAR SHAFT & BEARINGS

FOR MG6557 & MG6619

SHEET OF 1 1

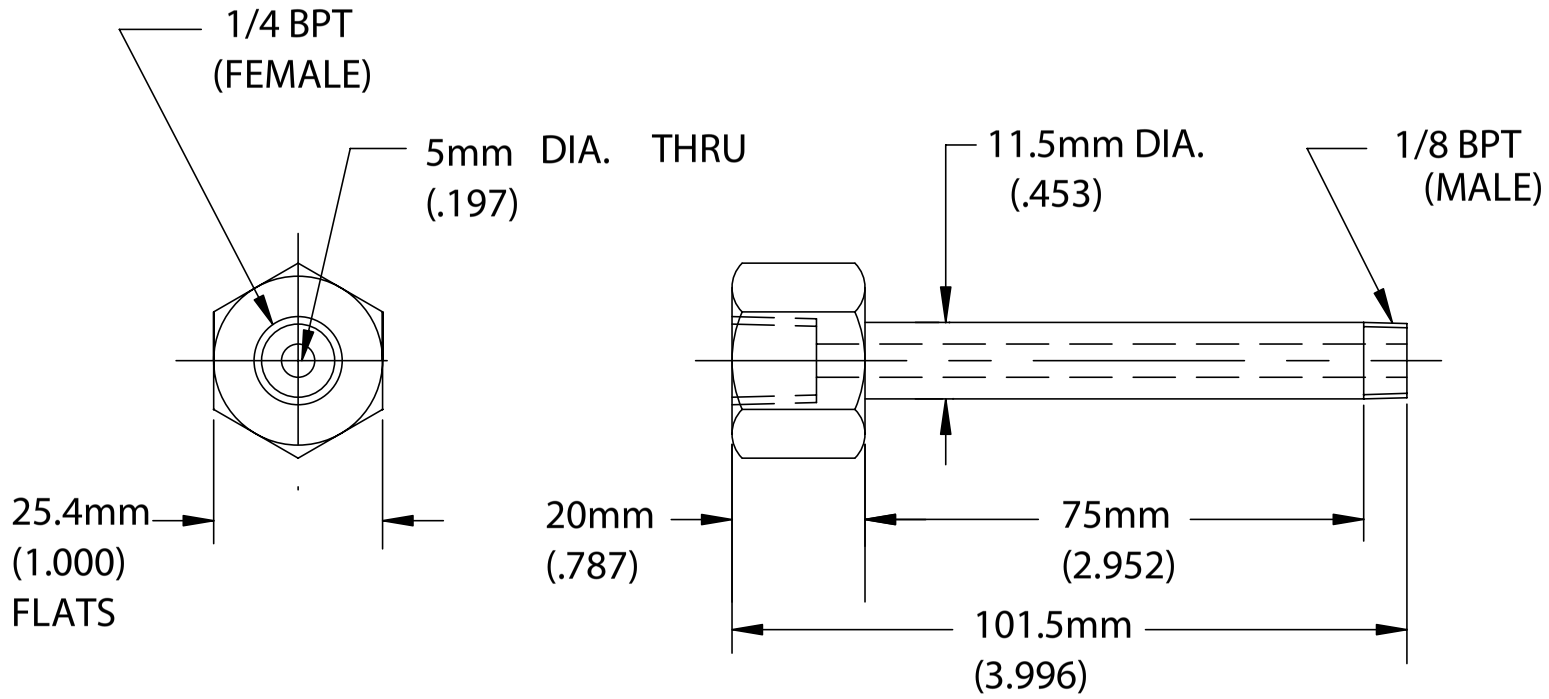
T-21482-17

TWIN DISC INC. RACINE, WIS.

CHANGE	DESCRIPTION	DATE	BY

STAMP TOOL NO.: T-21482-17
PART NO.: MG6557 & MG6619
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
.001 ON THREE PLACE DECIMAL DIMENSION
.01 ON FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 ON ANGULAR DIMENSION

CAD FILE : 21482-17



1 HYDRAULIC PRESSURE ADAPTER
MAT. : M.S. (1) REQ'D.
FOR MG 6619 MODELS

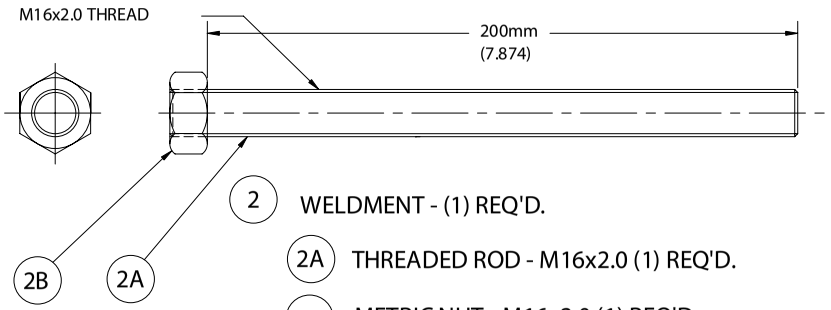
NOTE : UNLESS OTHERWISE SPECIFIED,
BREAK ALL SHARP CORNERS

CAD FILE : 21482-18

TWIN DISC, INC.	HYDRAULIC PRESSURE ADAPTER	1-26-98	JPL	PART NO: T-21482-18

576022

FORM 1390A

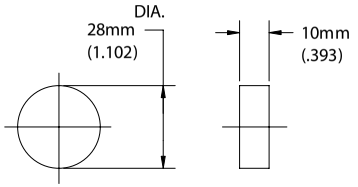


2 WELDMENT - (1) REQ'D.

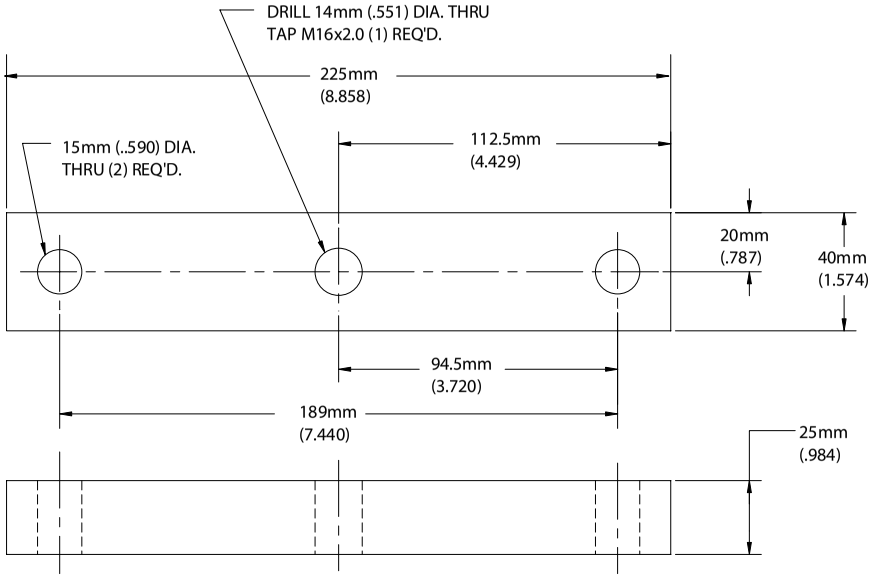
2A THREADED ROD - M16x2.0 (1) REQ'D.

2B METRIC NUT - M16x2.0 (1) REQ'D.

NOTE : THIS WELDMENT IS THE SAME AS T-21462-16 & T-21482-17



3 PROTECTOR - SHAFT (1) REQ'D.
MAT. : M.S.



1 PUSHER -OUTPUT SHAFT (1) REQD.
MAT. : MS.

NOTE : UNLESS OTHERWISE SPECIFIED,
BREAK ALL SHARP CORNERS

NOTE : USED WITH OIL INJECTION TOOLS
T-21482-8 & T-21482-18 TO
PUSH OUTPUT SHAFT OUT
OF HOUSING TO REMOVE
HOUSING FROM REAR HOUSING
COVER ON MODEL MG 6619

DET.	REQ.	MAT.	DESCRIPTION	STOCK SIZE
4	2	STK.	SOC. HD. CAP SCREW	M14x2.0 x 50mm LG.
3	1	M.S.	PROTECTOR - SHAFT	2.25 DIA. x 10mm (.393)
2B	1	STK.	METRIC THREADED ROD	M16x2.0 x 8.50 LG.
2A	1	STK.	METRIC NUT	M16x2.0
2	1		WELDMENT	
1	1	M.S.	PLATE - PUSHER	1.00 x 1.62 x 9.00 LG.

Date: 1-26-98 By: JPL F.P.N.: Scale: FULL

NAME PUSHER -OUTPUT SHAFT

FOR MG 6619

SHEET OF 1 1

T-21482-19

TWIN DISC INC. RACINE, WIS.

CHANGE	DESCRIPTION	DATE	BY

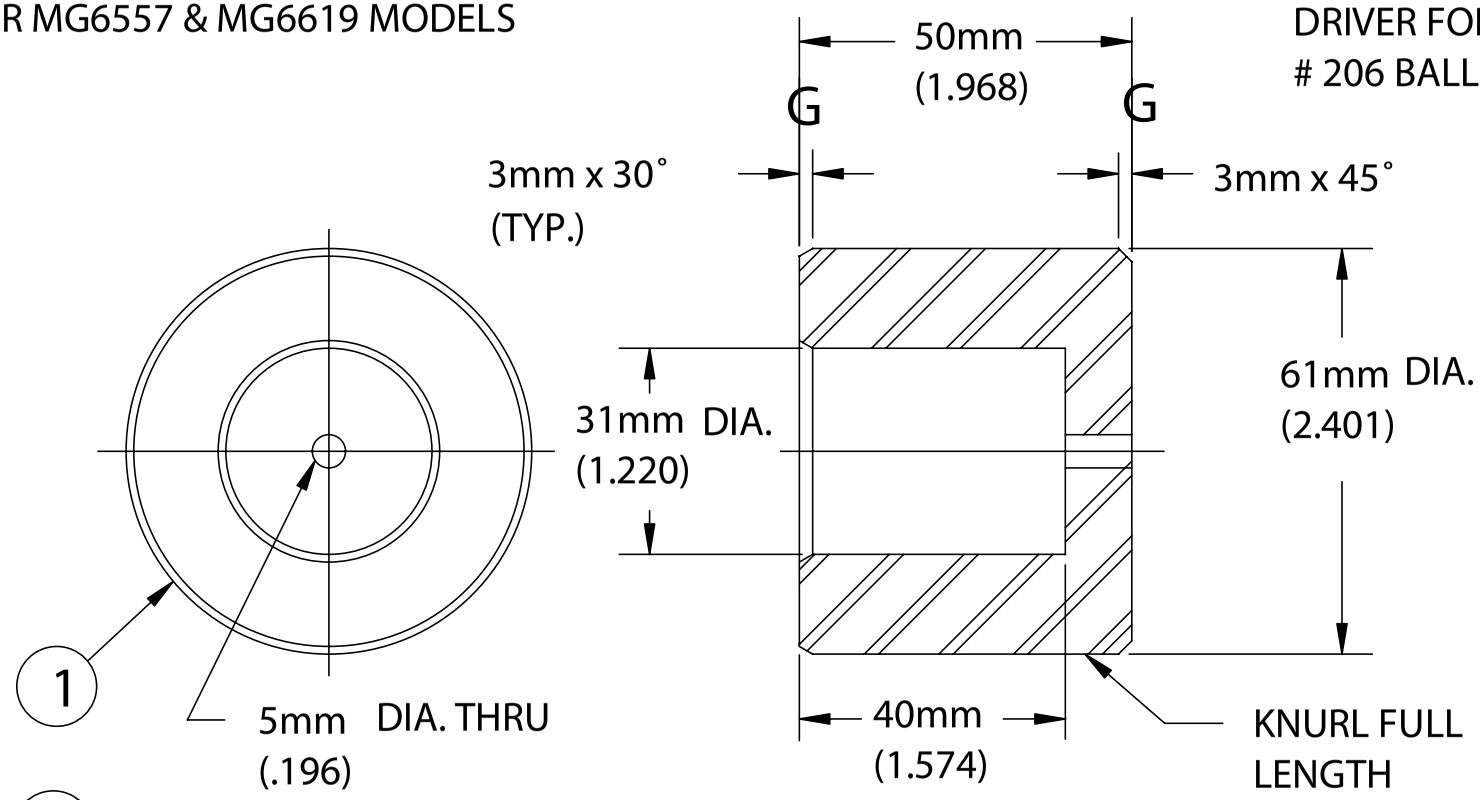
T-21482-19
MG 6619

STAMP TO OIL NO.:
PART NO.:
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
.001 ON THREE PLACE DECIMAL DIMENSION
.01 ON FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 ON ANGULAR DIMENSION

CAD FILE : 21482-19

FOR MG6557 & MG6619 MODELS

DRIVER FOR
206 BALL BRG.



1 BEARING DRIVER (1) REQ'D.

MAT. : TOOL STEEL (HD. & GRD.)

2.50 DIA. x 2.25 LG.

NOTE : UNLESS OTHERWISE SPECIFIED,
BREAK ALL SHARP CORNERS

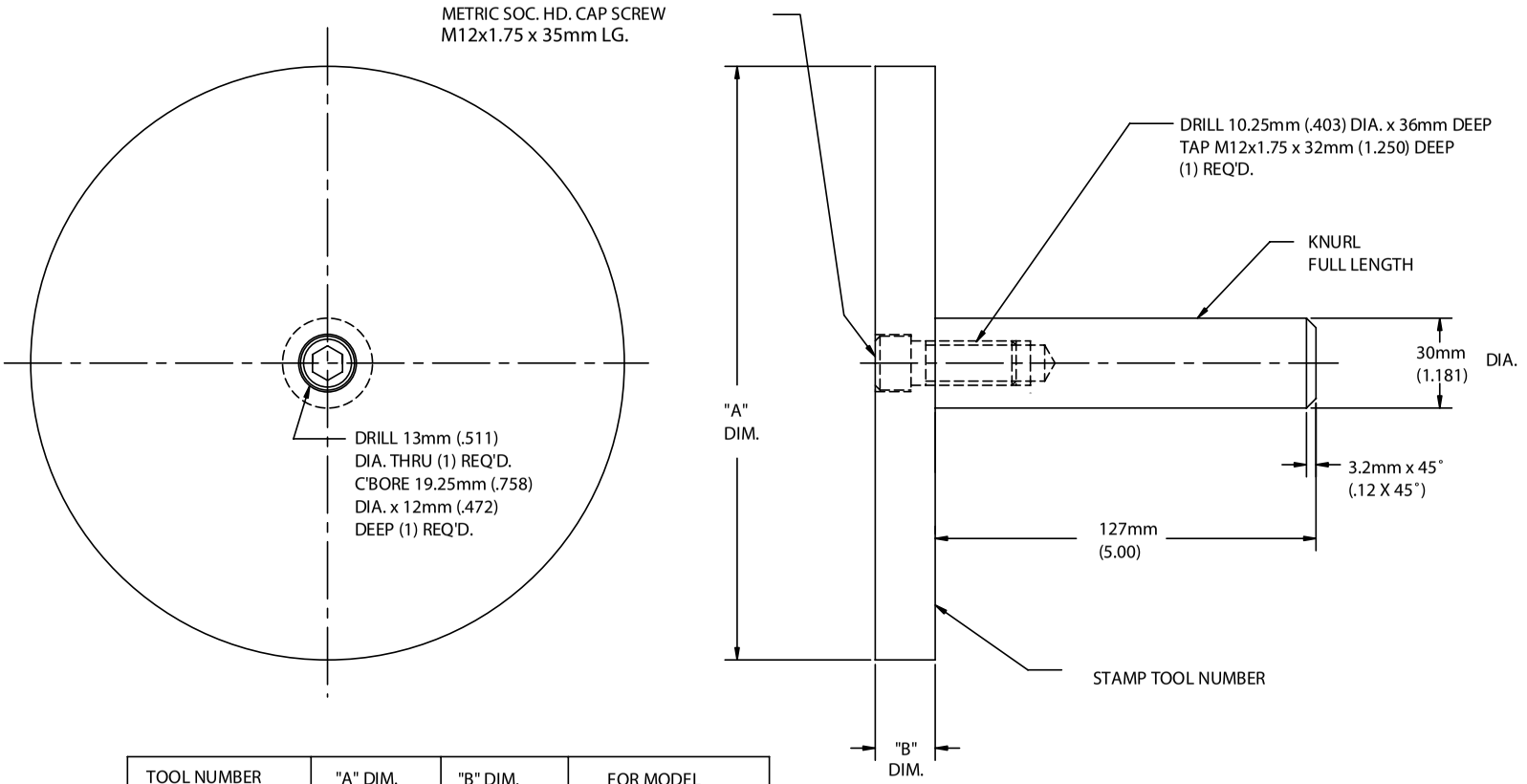
NOTE : ALL GRD. DIA'S. & SURFACES
MUST BE SQUARE & CONCENTRIC
TO WITHIN .005 OF EACH OTHER

CAD FILE : 21482-20

TWIN DISC, INC.	BEARING DRIVER	JPL	1-27-98	PART NO: T-21482-20

576022

FORM 1390A



TOOL NUMBER	"A" DIM.	"B" DIM.	FOR MODEL
T-21482-26	198mm	20mm	ALL MODELS
T-21482-27	178mm	20mm	ALL MODELS
T-21482-28	108mm	20mm	MG 6600 DC
T-21482-29	144mm *	20mm	MG 6557
T-21482-32	168mm	20mm	MG 6619
T-21482-33	141mm *	20mm	MG 6619
T-21482-34	188mm	20mm	MG 6619
T-21482-35	98mm	20mm	MG 6557

NOTE : MARKED WITH * CAN NOT
COMBINE THESE TOOLS

NOTE : UNLESS OTHERWISE SPECIFIED,
BREAK ALL SHARP CORNERS

3	1	STK.	SOC. HD. CAP SCR.	M16x2.0 x 45mm (1.77) LG.
2	1	D.R.	HANDLE	30mm(1.81) DIA. x 5.25 LG.
1	1	M.S.	DRIVER - BASE	(SEE CHART FOR SIZE)
DET.	REQ.	MAT.	DESCRIPTION	STOCK SIZE

Date: 4-2-98 By: JPL F.P.N.: Scale: FULL

NAME DRIVER -BEARING

FOR ALL MODELS

SHEET OF 1

T-21482-26

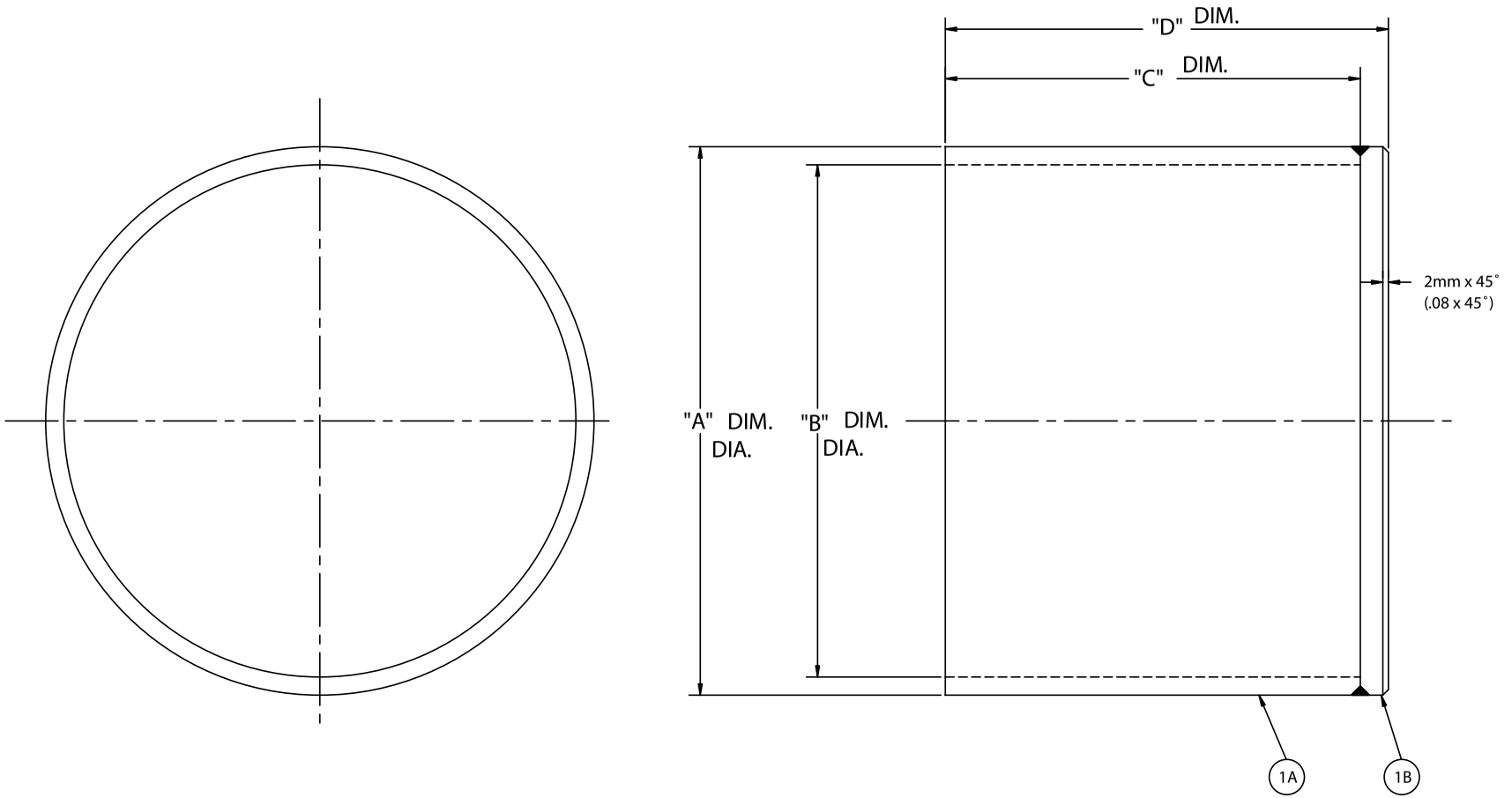
TWIN DISC INC. RACINE, WIS.

CHANGE	DESCRIPTION	DATE	BY

STAMP TOOL NO.: T-21482-26
PART NO.: ALL MODELS
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
.001 ON THREE PLACE DECIMAL DIMENSION
.010 ON FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 ON ANGULAR DIMENSION

CAD FILE : 21482-26

SERIES DRAWING



TOOL NUMBER	"A" DIM.	"B" DIM.	"C" DIM.	"D" DIM.	FOR MODELS
T-21482-30	198mm	185mm	150mm	160mm	MG 6600DC & MG 6557
T-21482-31	158mm	145mm	125mm	135mm	MG 6557 & MG 6619
T-21482-38	178mm	165mm	120mm	130mm	MG 6619

NOTE : UNLESS OTHERWISE SPECIFIED,
BREAK ALL SHARP CORNERS

1B	1	M.S.	BASE PLATE	SEE CHART FOR SIZES
1A	1	S.M.T.	TUBE	SEE CHART FOR SIZES
1	1		WELDMENT/WELDMENT	
DET.	REQ.	MAT.	DESCRIPTION	STOCK SIZE

Date: 4-3-98 By: JPL F.P.N.: Scale: FULL

NAME DRIVER - BEARING

FOR SEE CHART

SHEET OF 1 1

T-21482-30

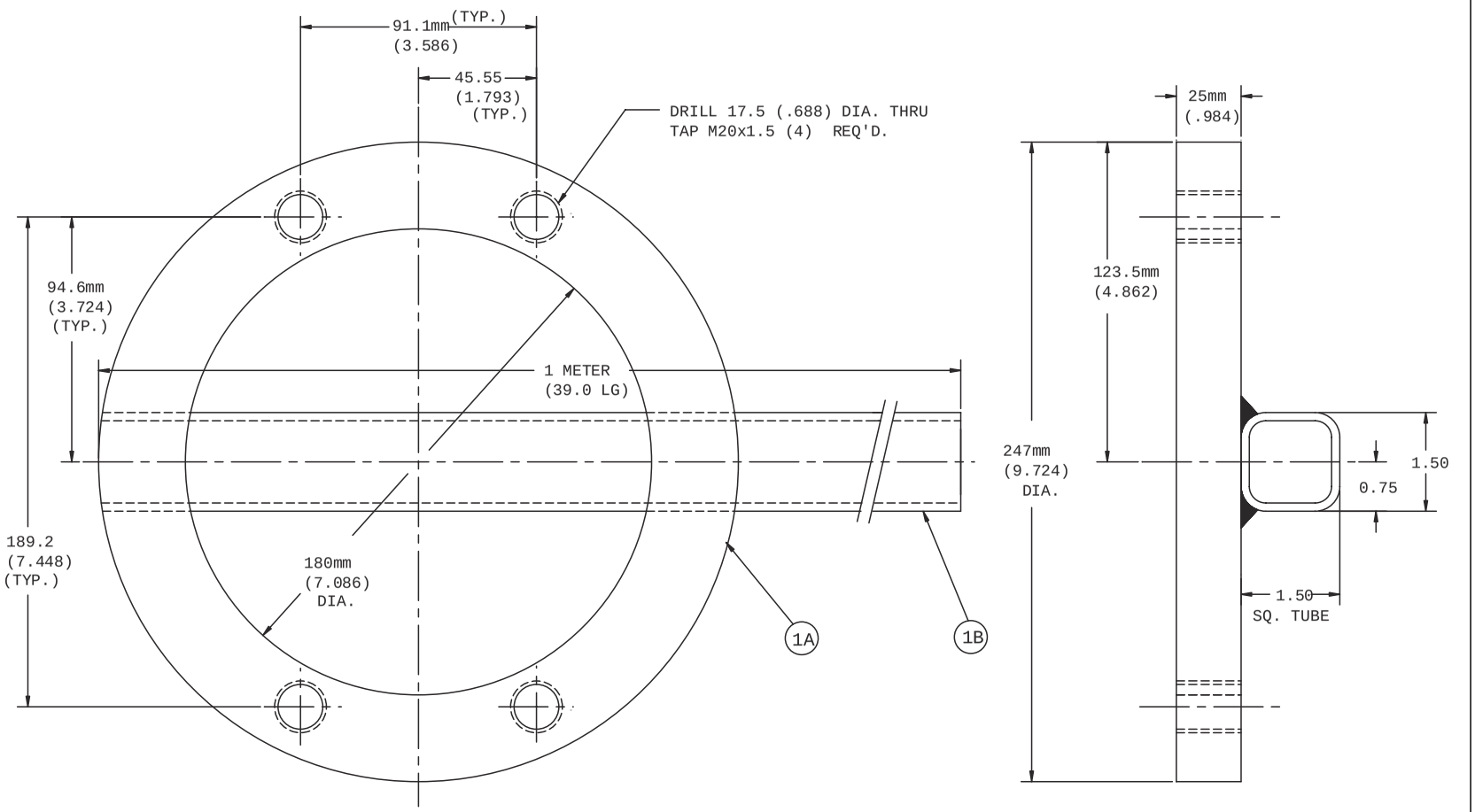
TWIN DISC INC. RACINE, WIS.

SERIES DRAWING

CHANGE	DESCRIPTION	DATE	BY

T-21482-30
T-21482-31
STAMP TOOL NO.: T-21482-38
PART NO.: NOTED
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
.001 ON THREE PLACE DECIMAL DIMENSION
.01 ON FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 ON ANGULAR DIMENSION

CAD FILE : 21482-30



NOTE : UNLESS OTHERWISE SPECIFIE D,
BREAK ALL SHARP CORNERS

DET.	REQ.	MAT.	DESCRIPTION	STOCK SIZE
1B	1	TUB.	HANDLE	1.5 SQ. TUBE 40" LG.
1A	1	M.S.	BASE PLATE	250mm (9.842) DIA. x 25mm (. 984)
1	1		WELDMENT - HOLDING TOOL	

Date: 4-9-98 | By: JPL | F.P.N.: | Scale: FULL

NAME HOLDING TOOL TO TORQUE / REMOVE OUTPUT SHAFT SCREWS

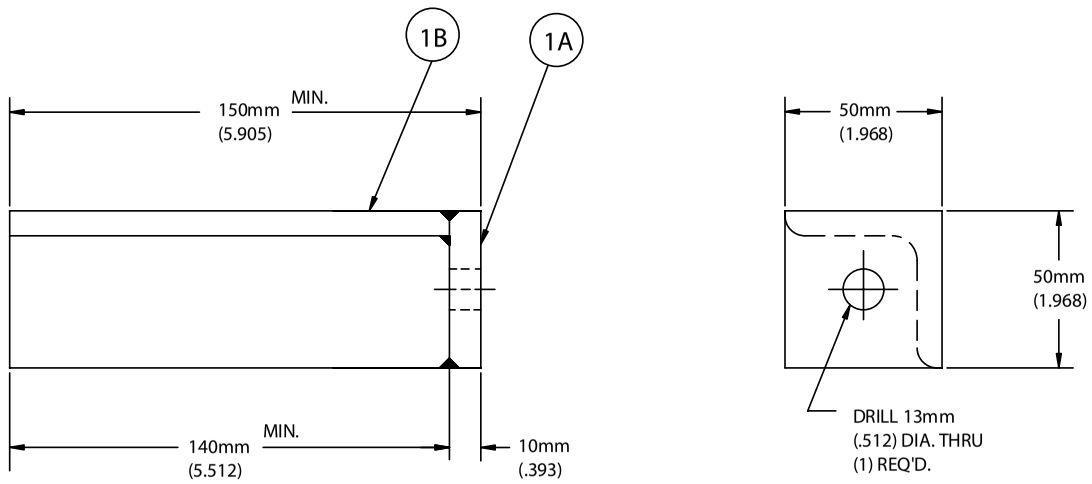
FOR MG 6619 | SHEET 1OF 1

TWIN DISC INC. RACINE, WIS. | T-21482-37

CHANGE	DESCRIPTION	DATE	BY

STAMP TOOL NO.: T-21482-37
PART NO.: MG 6619
BREAK ALL SHAR P CORNERS
TOLERANCE UNLE SS OTHERWISE SPECIFIED
.005 ON THREE PLACE DECIMAL DIMENSION
.030 ON FRACTION AL AND TWO PL ACE DECIMAL DIMENSION
1/4 ON ANGULA R DIMENSION

CAD FILE : 21482-37



1 WELDMENT - SUPPORT BRACKET (4) REQ.D.

1A TOP PLATE (1) REQ'D.
MAT. : M.S.
10mm (.393) x 2.00 x 2.00

1B ANGLE SUPPORT (1) REQ'D.
MAT. : ANGLE IRON
2.0 x 2.0 x .31 WALL x 6.00 LG.

NOTE : UNLESS OTHERWISE SPECIFIED,
BREAK ALL SHARP CORNERS

DET.	REQ.	MAT.	DESCRIPTION	STOCK SIZE
1B	1	ANGLE IRON	ANGLE SUPPORT	SEE DETAIL OF SIZES
1A	1	M.S.	TOP PLATE	SEE DETAIL OF SIZES
1	4		WELDMENT - SUPPORT BRACKET	

Date: 1-27-98 By: JPL F.P.N.: Scale: FULL

NAME SUPPORT BKT. - LEG
(FOR ASSY. & DIS-ASSY.)

FOR MG 6557 , MG 6600 &
MG 6619

SHEET OF 1 1

T-21482-39

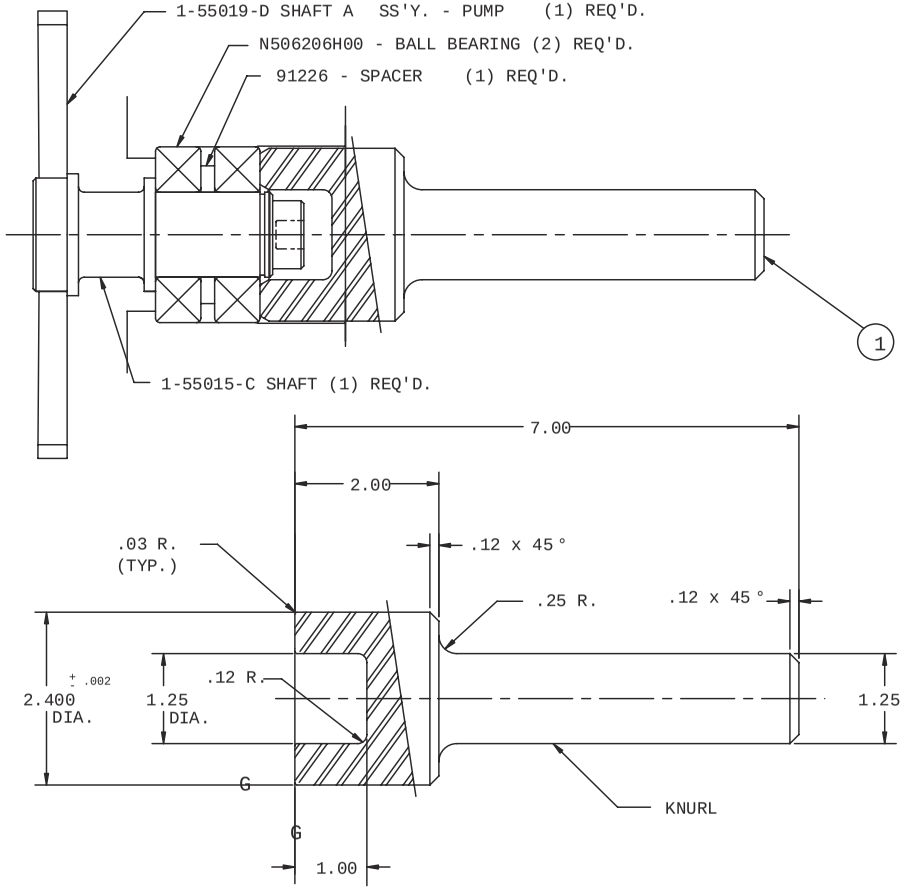
TWIN DISC INC. RACINE, WIS.

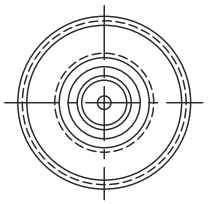
CHANGE	DESCRIPTION	DATE	BY

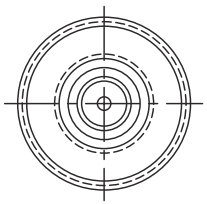
MG 6557
MG 6600
MG 6619

STAMP TOOL NO.: T-21482-39
PART NO.:
BREAK ALL SHARP CORNERS
TOLERANCE UNLESS OTHERWISE SPECIFIED
.001 ON THREE PLACE DECIMAL DIMENSION
.010 ON FRACTIONAL AND TWO PLACE DECIMAL DIMENSION
1/4 ON ANGULAR DIMENSION

CAD FILE : 21482-39







FOR MG 6557 SC
INSTALL BALL BEARIN GS
#N506206H00 (2) REQ'D.
WITH SPACER 91226
BETWEEN BEARINGS

N0TE : UNLESS OTHERWISE SPECIFIE D,
BREAK ALL SHARP CORNERS

NOTE : ALL GROUND (G) DIA'S. & SURFACES
TO BE SQUARE & CONCENTRIC
WITHIN .005 OF EACH OTHER

				(CARB. & HDN.)	
1	1	T.S.	DRIVER - BEARING		2.25 DIA. x 7.25 LG.
DET.	REQ.	MAT.	DESCRIPTION		STOCK SIZE
Date: 2-23-98		By: JPL		F.P.N.:	Scale: FULL

CHANGE	DESCRIPTION	DATE	BY

NAME DRIVER - BEARING

FOR MG 6557 SC

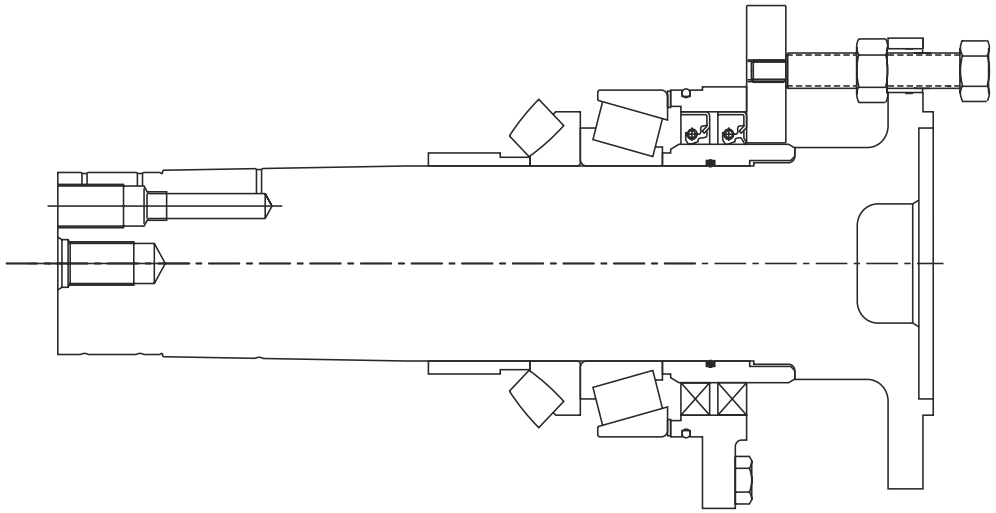
SHEET 1OF 1

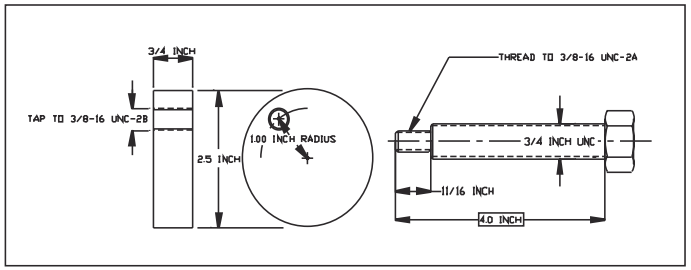
T-21482-45

TWIN DISC INC. RACINE, WIS.

STAMP TOOL NO.: T-21482-45
PART NO.: MG 6557 SC
DRAWING ALL SHARP .R CHAMFERS
TOLERANCES UNLESS OTHERWISE SPECIFIED
.001 ON THREE PLACE DECIMAL DIMENSION
.010 ON FRACTION AS AND END PL. ACE
DECIMAL DIMENSION
X2-1 ON ANGLES .R DIMENSION

CAD FILE : 21482-4 5





METRIC

THIRD ANGLE PROJECTION

NOTICE: THIS PRINT CONTAINS PROPRIETARY INFORMATION AND IS NOT TO BE USED IN ANY MANNER DETRIMENTAL TO THE INTERESTS OF TWIN DISC, INCORPORATED RACINE, WI 53403 - USA
THIS NOTICE IS NOT INTENDED TO NULLIFY OR LIMIT RIGHTS GRANTED TO THE U.S. GOVERNMENT OR OTHERS BY CONTRACT.

REV	SHEET	ZONE	CH. NO.	DATE

MATERIAL

HEAT TREAT

SURFACE TREATMENT

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DIMENSIONS
X.X ±0.25
X.XX ±0.12
ALL ANGULAR TOLERANCES ±1°
BREAK SHARP EDGES/CORNERS PER ANSI Y14.5M 1982

DRAWN KDS

CHK.

APPR.

TOOL TO HOLD OUTPUT SEAL CARRIER

SCALE 1.00=1.00

TWIN DISC INCORPORATED RACINE, WI 53403 - USA

T-21578-4

SHEET 1 OF 1 REV ---

Engineering Drawings

List of Engineering Drawings

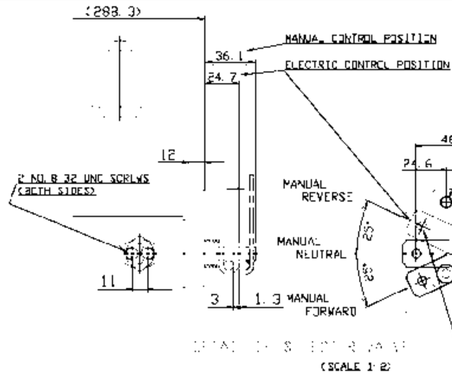
The following pages include the engineering drawings that are specific to this model. The engineering drawings included are listed below and continued on the following page.

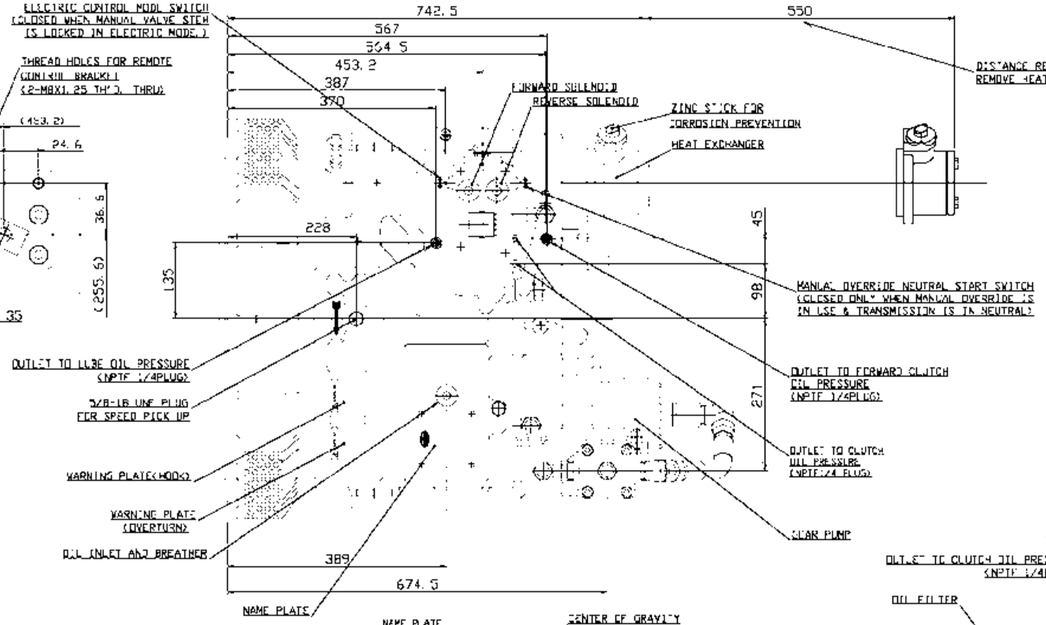
Note: Any part numbers listed in the following engineering drawings are for reference only. Please refer to your bill of material for part numbers specific to your model.

❑	739208	Marine Transmission, General View
❑	737450	Marine Transmission, Sectional View
❑	737449	Marine Transmission, General View
❑	739209	Marine Transmission, Sectional View
❑	A7119W	Hydraulic Diagram, Electric Valve
❑	349460	Hydraulic Schematic, Transmission
❑	1018084	Valve Assembly - Control (without trolling valve)
❑	1020025	Valve Assembly, Trolling
❑	168753G	Valve Assembly, Trolling
❑	549091	Pump Assembly, Trailing
❑	737004A	Live Pump Mount Power Take-off
❑	737064B	Clutchable Pump Mount Power Take-off

MG-6619-00-SC MARINE GEAR SPECIFICATIONS

GEAR RATIO	1.06 1.33 1.53 1.73 2.03 2.44 2.72 2.93		
TOTAL MASS	APPROX. 508 kg (DRY) EXCLUDING FLEXIBLE COUPLING AND OUTPUT COMPANION FLANGE		
OIL QUANTITY	APPROX. 22 L		
OIL PRESSURE	CLUTCH OIL 2.4-2.6 MPa	AT RATED ENGINE SPEED	
	LUBE OIL 0.2-0.6 MPa	OIL TEMP. 65~75°C	
OIL VISCOSITY	SAE #40 (MULTI-GRADE OIL IS NOT APPROVED)		
OIL & GREASE CHANGE INTERVAL	THE FIRST OIL CHANGE AT 100 HOURS OF OPERATION AND SUBSEQUENTLY EVERY 1000 HOURS OF OPERATION		
SHIFTING LEVER EFFORT	6.4 N·m MAX.		
STRAINER	WIRE NETTING		
SHIFTING RESTRICTION	SHIFT TO FORWARD OR REVERSE FROM NEUTRAL AND SHIFT ACROSS NEUTRAL SHALL BE MADE AT ENGINE SPEED LOWER THAN 50% OF THE RATED SPEED		
HEAT EXCHANGER	WATER FLOW (RAW WATER)	60-80 L/min	
	TEMPERATURE OF COOLING WATER	32 °C MAX.	
	SECTIONAL VIEW DWG NO.	7-39209	
	VULASTIK-L COUPLING	L1015474	
	GEAR PUMP TOOTH WIDTH	42 mm	

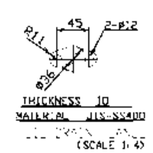


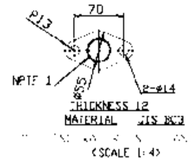


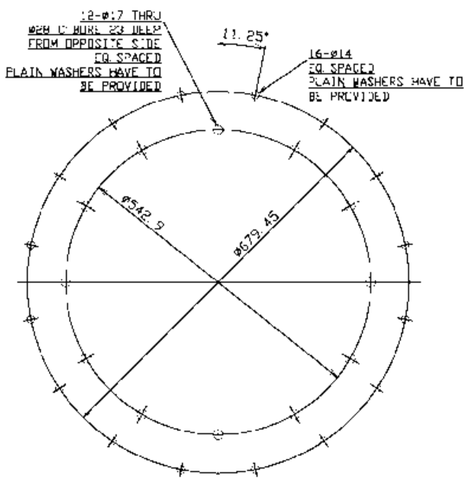
CONNECTOR

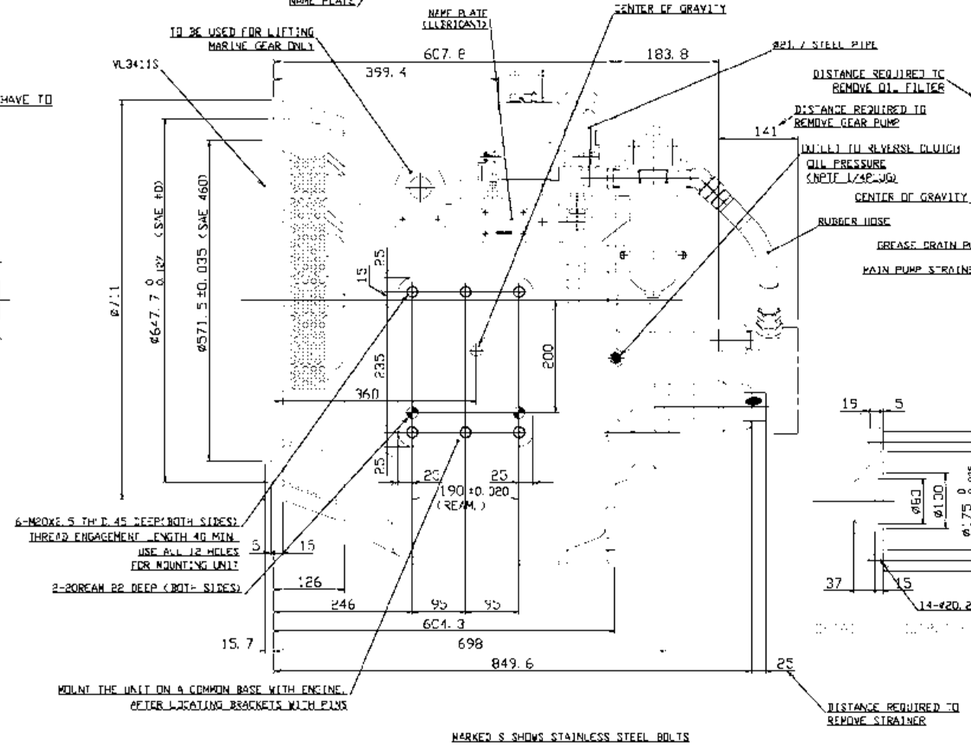
REVERSE SOLENOID	○	○
FORWARD SOLENOID	○	○

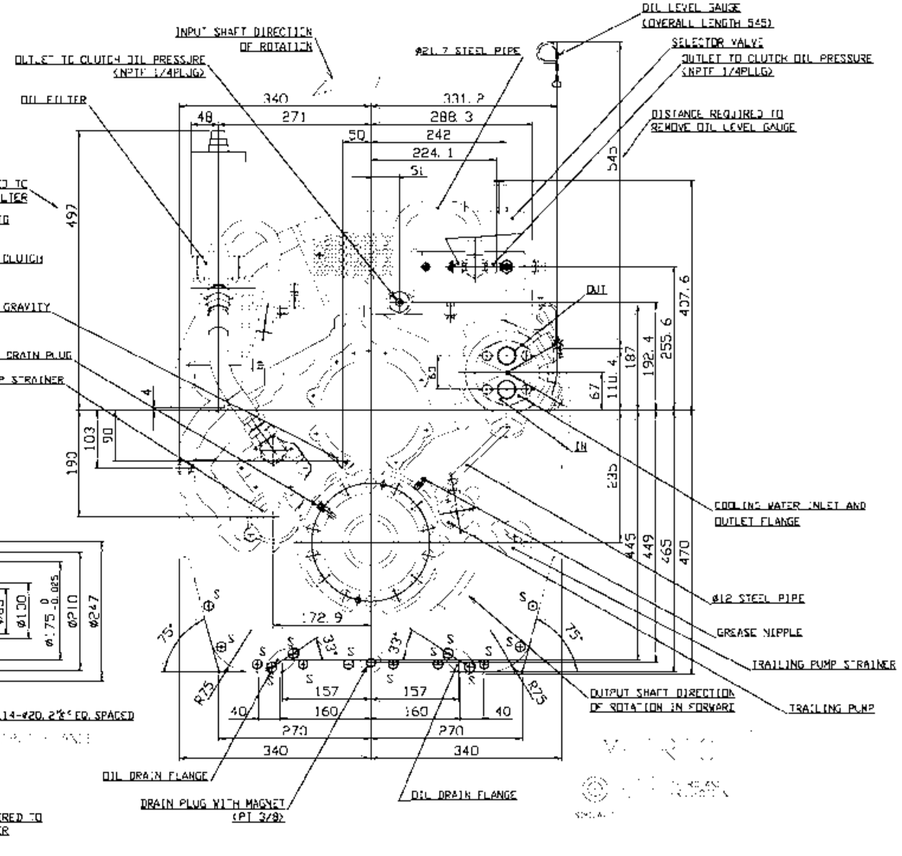
WIRING DIAGRAM
(OPERATING VOLTAGE : 24VDC)





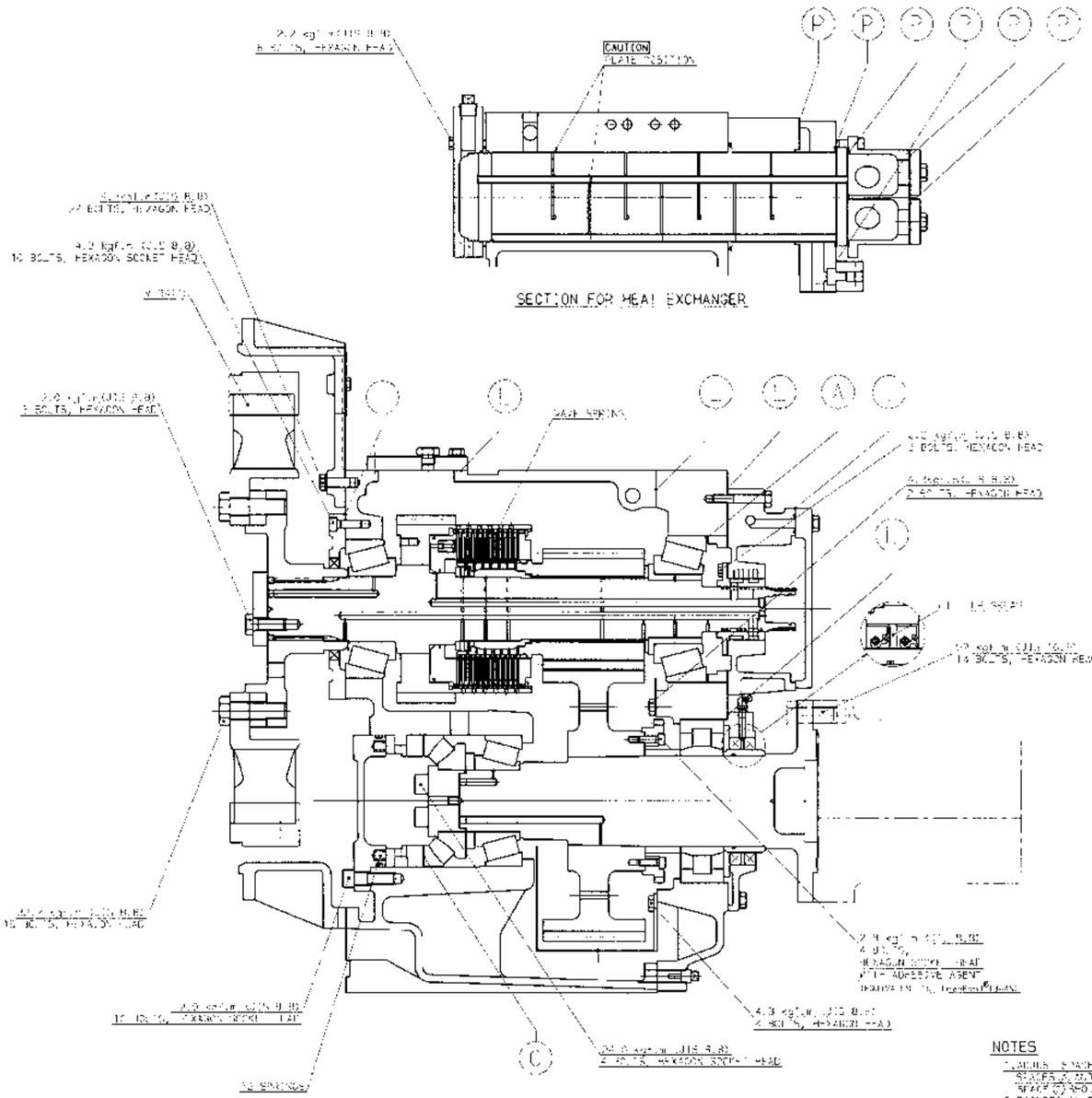

12-ø17 THRU ø28.5 BORE DEEP FROM OPPOSITE SIDE EQ SPACED PLAIN WASHERS HAVE TO BE PROVIDED
11.25°
16-ø14 EQ SPACED PLAIN WASHERS HAVE TO BE PROVIDED
ø542.9
ø579.45

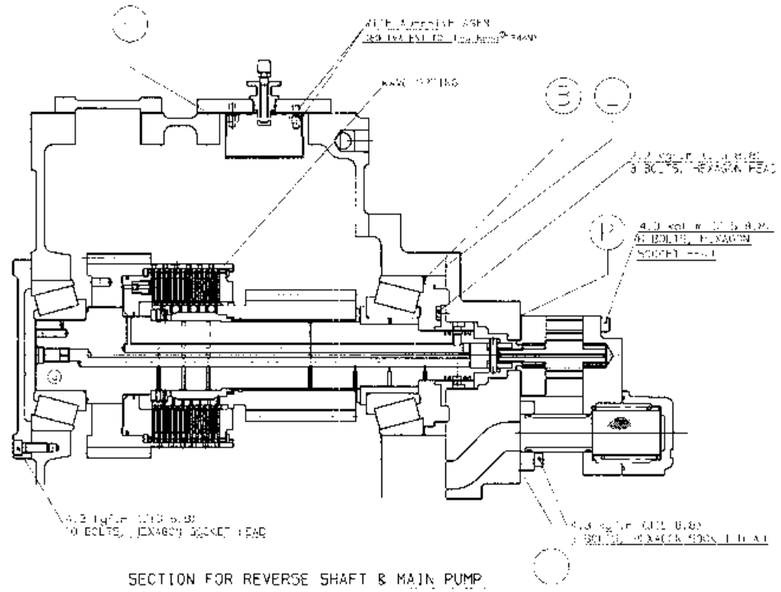


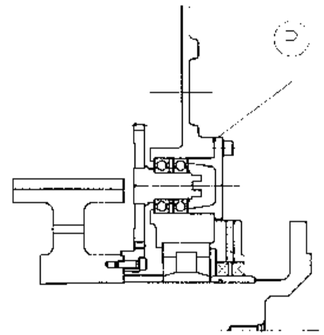


MARKED S SHOWS STAINLESS STEEL BOLTS

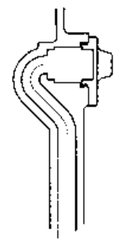
0304PP TWIN DISC
L.S
K.K
K.I.
Y.T.







BLIND COVER FOR WITHOUT TRAILING PUMP



BLIND COVER FOR WITHOUT OIL STRAINER

NOTES

1. APPLY SEALANT TO ITEMS (A), (B), AND (C) FOR EACH SEAT. NOTE BE TO SQUEEZE SEALANT BEAD OUT BEYOND THE SEAT WIDTH WHEN BEADS (A) AND (B) ARE COMPRESSED.
2. FIGURES IN THE DRAWING SHOW TIGHTENED TORQUE FOR MACH. MACHINE SURFACE.
3. APPLY (D) SEALING SEAT PASSAGE.
4. COAT LIQUID PACKING ON THE PORTION MARKED (E) AND ASSEMBLE THEM.

REV	BY	APPD.

REV	ZONE	CH. NO.	DATE
		*******	
		*******	
		*******	
		*******	
		*******	
		*******	

REV	ZONE	CH. NO.	DATE
		*******	
		*******	
		*******	
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		*******	
		*******	

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MATERIAL	
HEAT TREAT	
SURFACE TREATMENT	
WEIGHT	kg / lb
FIRST USE	A65A, MODEL MG-5819-DD-DC
NAME	SECTIONAL VIEW

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN MACHINED DIMENSIONS
X ±0.5
.XX ±0.25
.XXX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

DATE 1-24-86
SCALE 1:5
DRN. 1-24-86
CHK. 1-24-86
APPD. 1-24-86

TWIN DISC INCORPORATED
RACINE, WI 53403 - USA

Z-37450

SHEET 1 OF 1 REV. G

(A-T)

VS-66 9-00-SC MARINE GEAR SPECIFICATIONS

GEAR RATIO	1.36 1.93 1.93 1.93 2.03 2.46 2.72 2.93
TOTAL WEIGHT	APPROX. 595 kg (DRY)
OIL CAPACITY	APPROX. 25
OIL PRESSURE	
OIL VISCOSITY	SAE #30 CONSTANT MESH GEAR OILS
OIL & OIL FILTER CHANGE INTERVAL	THE FIRST OIL CHANGE AT 100 HOURS OF OPERATION AND SUBSEQUENTLY EVERY 1000
OPERATING TEMPERATURE	176oF or MAX
GEAR SET	HELICAL
ROTATION DESCRIPTION	FACING TO FORWARD (OUTPUT FROM VS-66A AND C) ... ACHIEVED VIA FIRST STAGE GEAR SET
HEAT EXCHANGER	WATER FLOW (GPM) 60-80
	TEMPERATURE OF COOLING WATER 32 TO 85oC

SPECIFICAL WITH THIS SC	7-37449
REJECTED DRAWING	7-37444
HEAT PUMP TORQUE LIMIT	42 Nm

DETAIL OF SELECTOR VALVE

WIRING DIAGRAM (OPERATING VOLTAGE 12 VOLTS)

FORWARD SOLENOID

REVERSE SOLENOID

GROUND

OIL DRAIN FLANGE

COOLING WATER INLET AND OUTLET FLANGE

DETAIL OF OUTPUT COMPANION FLANGE

RECOMMENDED

NOT RECOMMENDED

MOUNT THE UNIT ON A COMMON BASE WITH ENGINE. AFTER LOCATING DRAWERS KEEP PINS

CENTER OF GRAVITY

SELECTOR VALVE

OIL FILTER

DRAIN PLUG WITH MAGNET

OIL DRAIN PLUG

METRIC

THIRD ANGLE PROJECTION

SINUM 73

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MATERIAL

HEAT TREAT

SURFACE TREATMENT

FINISH

NAME: GENERAL VIEW

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MACHINED DIMENSIONS

ALL ANGULAR TOLERANCES ±1° GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DRAWN

CHK.

APPD.

DATE

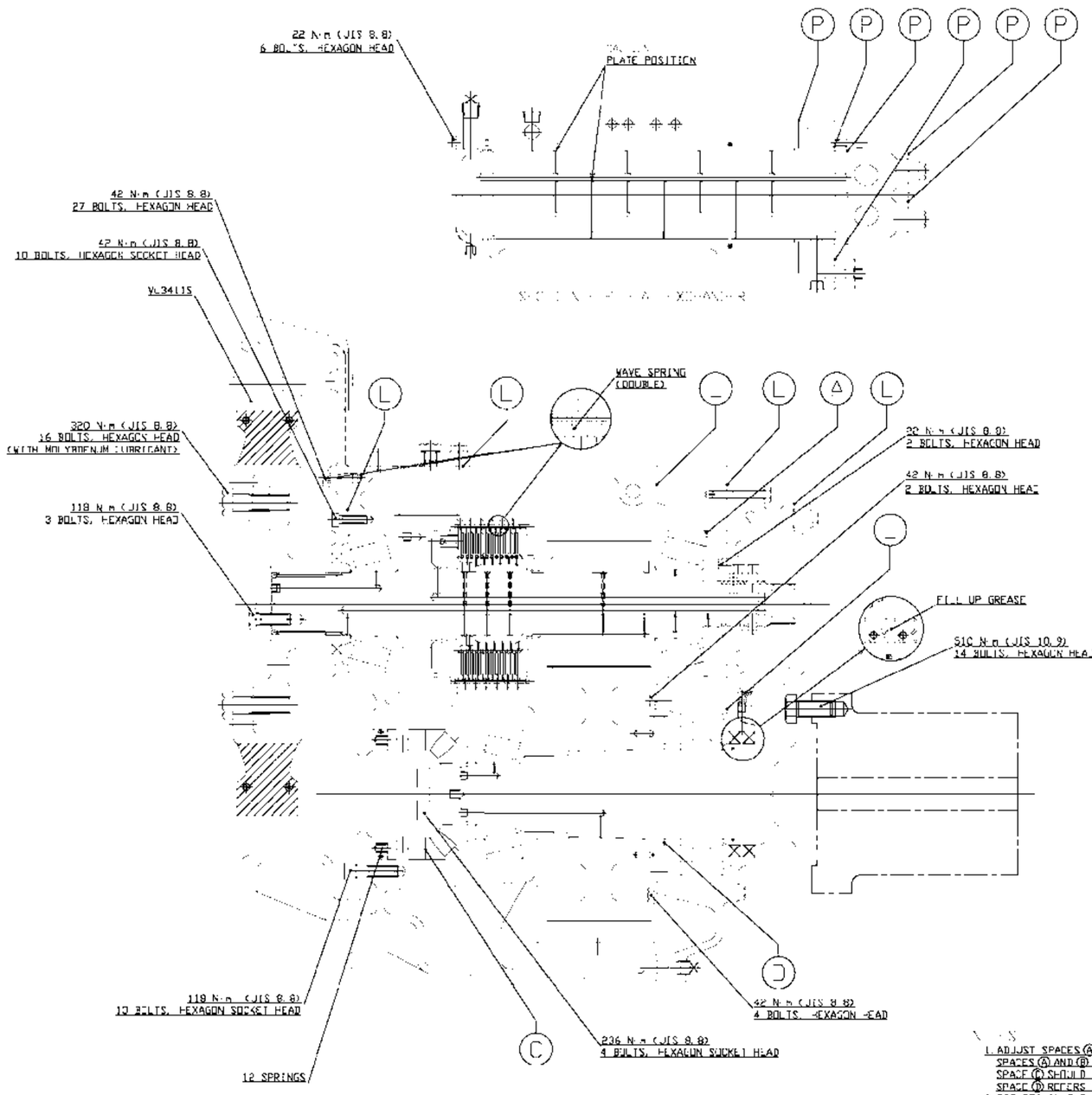
SCALE 1:5

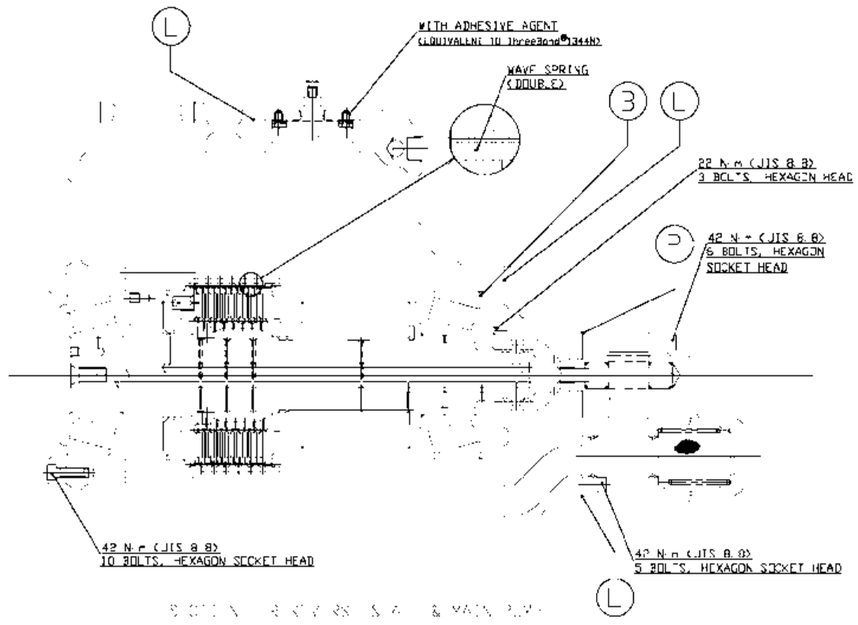
TWIN DISC INCORPORATED RACINE, WI 53403 - USA

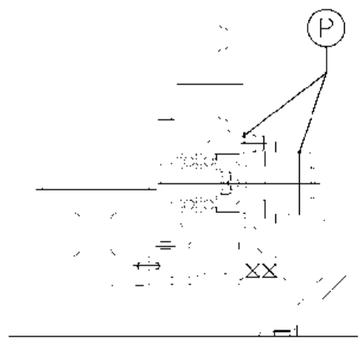
7-37449

SHEET 1 OF 1 REV -

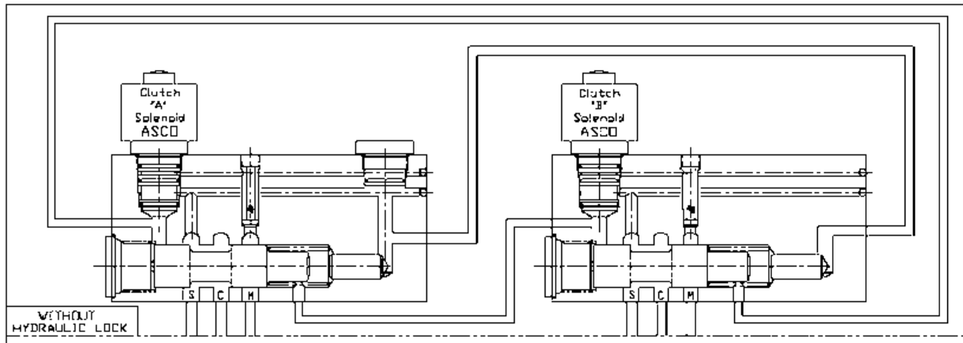
A1T

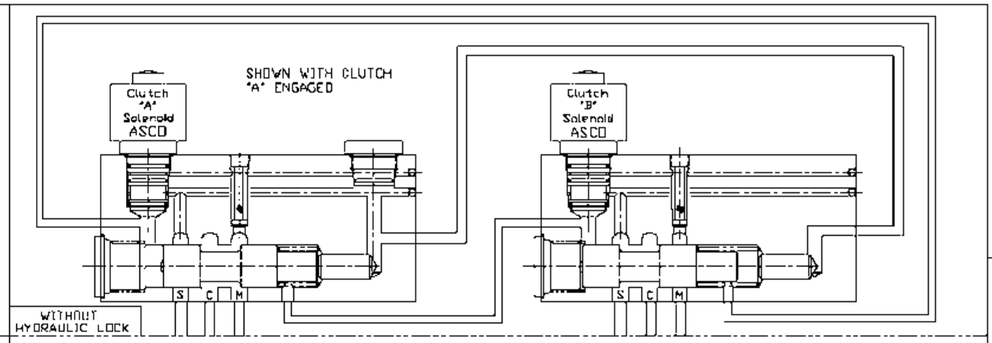


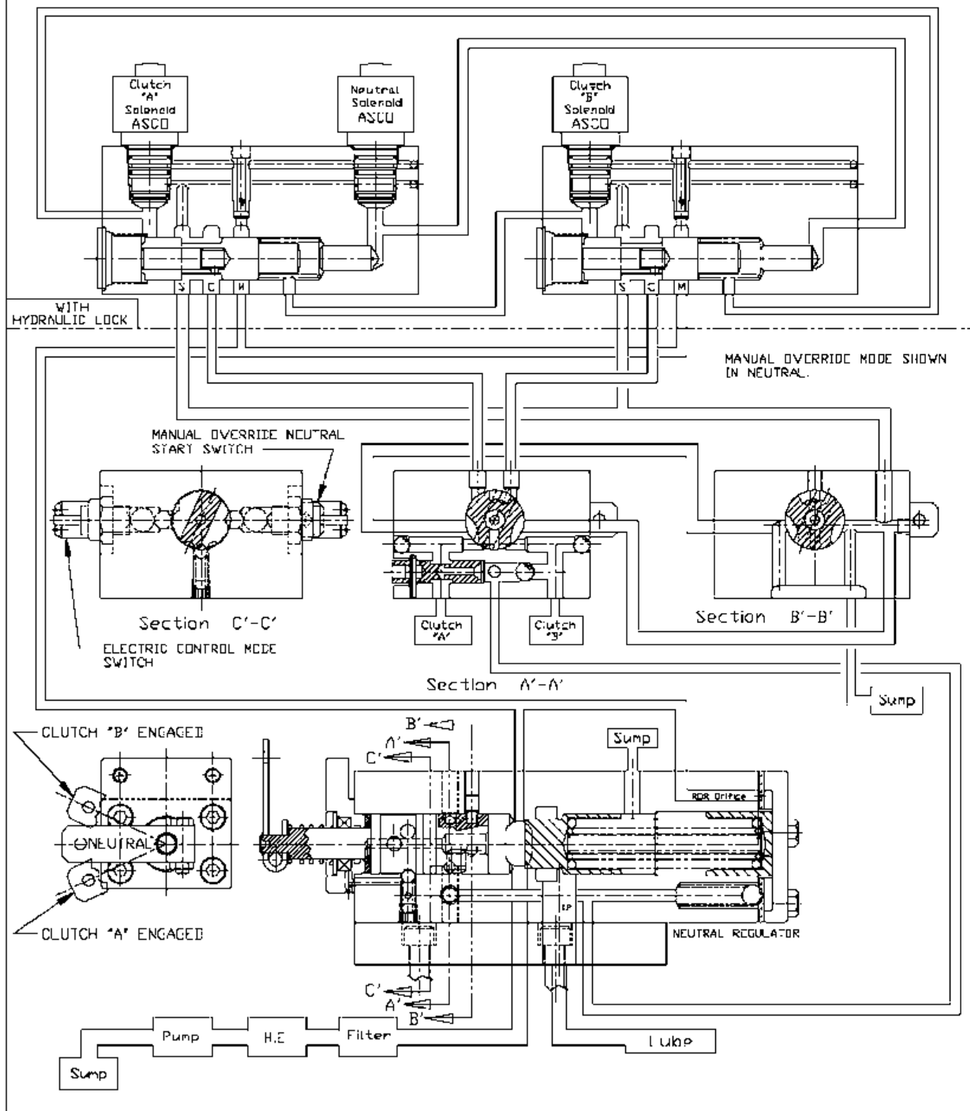


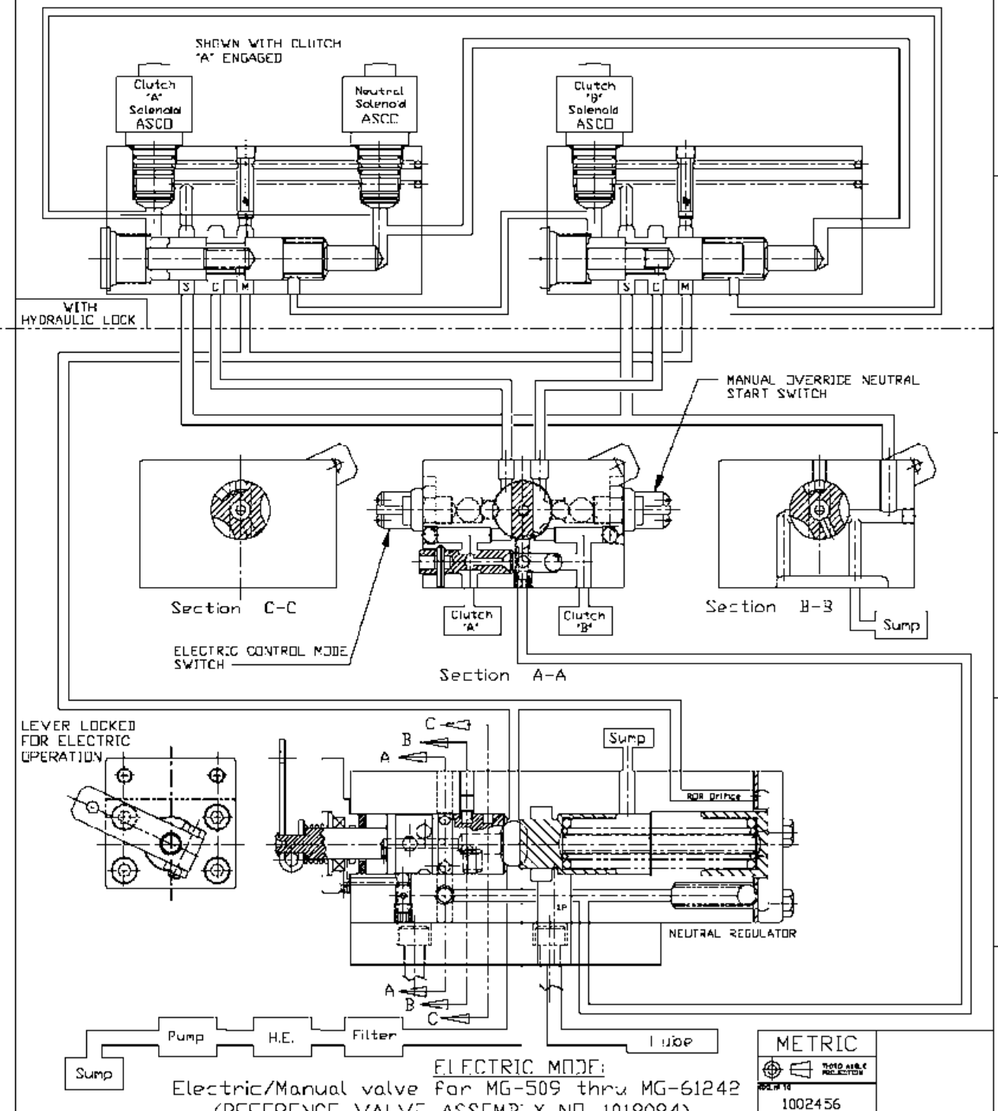


1. ADJUST SPACES Ⓐ, Ⓑ, AND Ⓒ FOR EACH SHAFT WITH SHIMS.
   SPACES Ⓐ AND Ⓑ SHOULD BE -0.05 ~ +0.05 mm
   SPACE Ⓒ SHOULD BE 0 ~ +0.05 mm.
   SPACE Ⓓ REFERS TO OTHER DRAWING 3.49517.E.
2. FIGURES IN THE DRAWING SHOW TIGHTENED TORQUE FOR MAIN IMPORTANT BOLTS.
3. MARKED Ⓟ SHOWS SEAT PACKINGS.
4. COAT LIQUID PACKING ON THE PORTION MARKED Ⓛ AND ASSEMBLE THEM.









MANUAL MODE: ELECTRIC/MANUAL VALVE FOR MG-509 THRU MG-61242
(REFERENCE VALVE ASSEMBLY NO. 1018084)

ELECTRIC MODE:
Electric/Manual valve for MG-509 thru MG-61242
(REFERENCE VALVE ASSEMBLY NO. 1018084)

C = CLUTCH APPLY
I.P. = INTERMEDIATE PRESS. (LUBE)
M = MAIN PRESS.
S = SUMP

3	A	20314	4-27-59						

METRIC

1002456

DIAGRAM, HYDRAULIC (WITHOUT TROLLING VALVE)

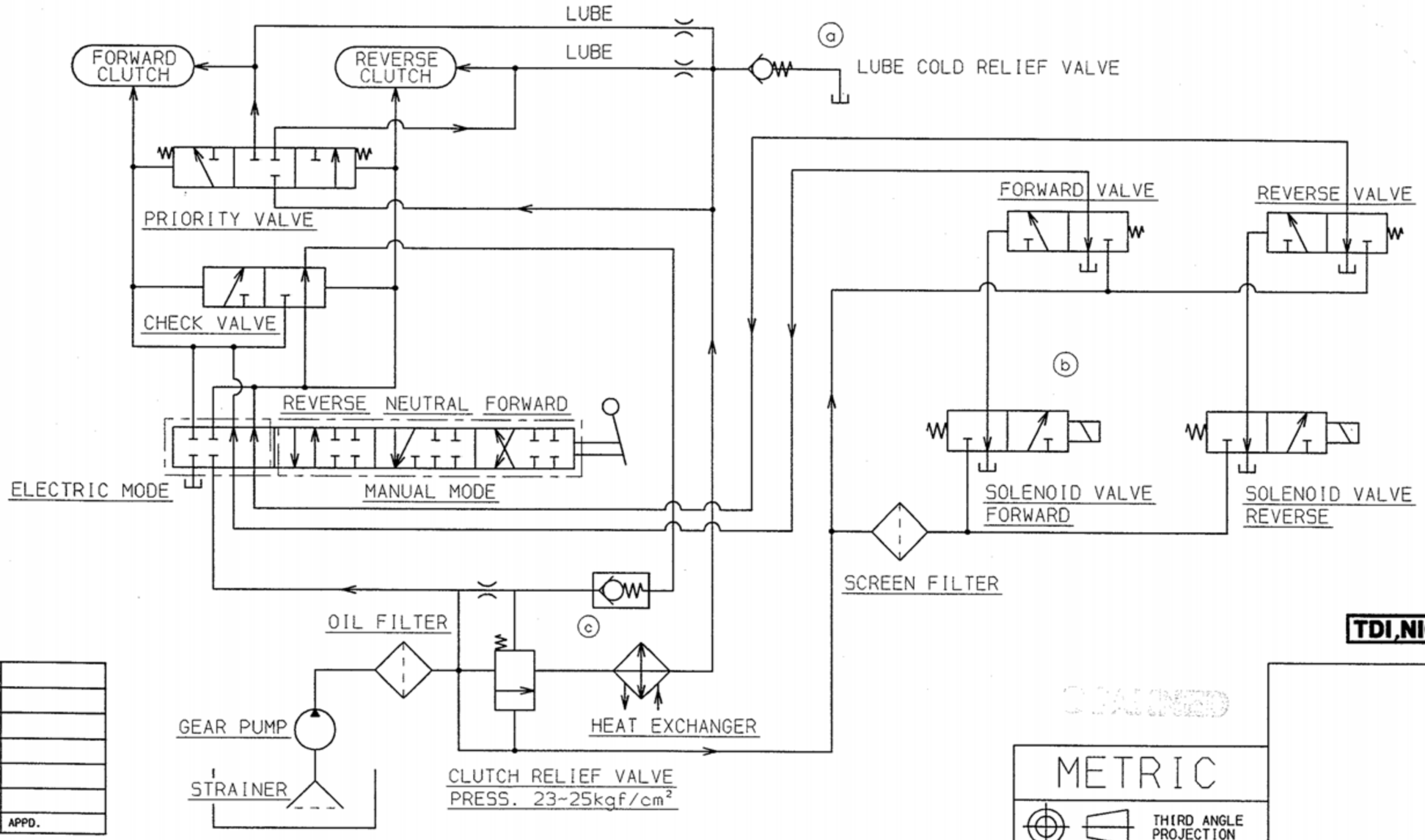
TWIN DISC

A7119W

SHEET 1 OF 2 REV. A

E D C B A

6 5 4 3 2 1



REV	BY	APPD.
c	Y.K.	
b	Y.K.	
a	K.I.	

REV	CH. NO.	DATE	REV	CH. NO.	DATE
	*******			*******	
	*******			*******	
	*******			*******	
c	-	2-10-98		*******	
b	--	12-16-97		*******	
a	---	5-26-97		*******	

SIMILAR TO

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MATERIAL
-

HEAT TREAT
-
-

SURFACE TREATMENT

WEIGHT XXXX kg | WR² N·m²

FIRST USE
ASSY.
MODEL MG-6600-00-DC

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X. ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

NAME
HYDRAULIC DIAGRAM

DATE 970318
SCALE 1:1
DRN. S.NAKAMURA
CHK.
APPD.

TDI,NICO

METRIC

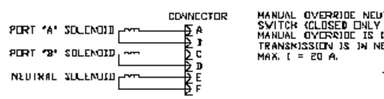
THIRD ANGLE PROJECTION

TWIN DISC INCORPORATED
RACINE, WI 53403 - USA

3-49460

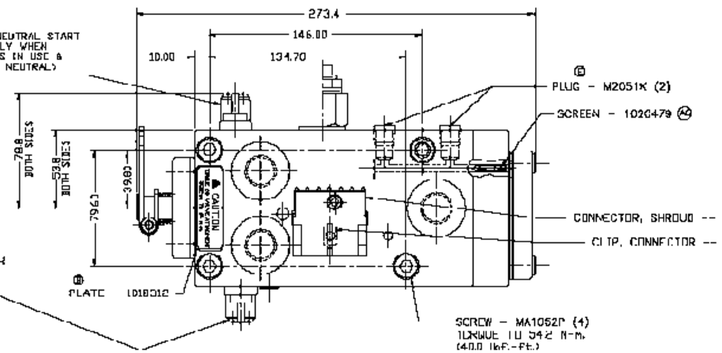
SHEET 1 OF 1 | REV ---

WIRING DIAGRAM



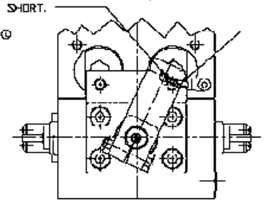
OPTIONAL:
MATING WIRING HARNESS 1017403
SERIES (SPECIFY LENGTH)

MANUAL OVERRIDE NEUTRAL START SWITCH (CLOSED ONLY WHEN MANUAL OVERRIDE IS IN USE & TRANSMISSION IS IN NEUTRAL) MAX. I = 20 A.



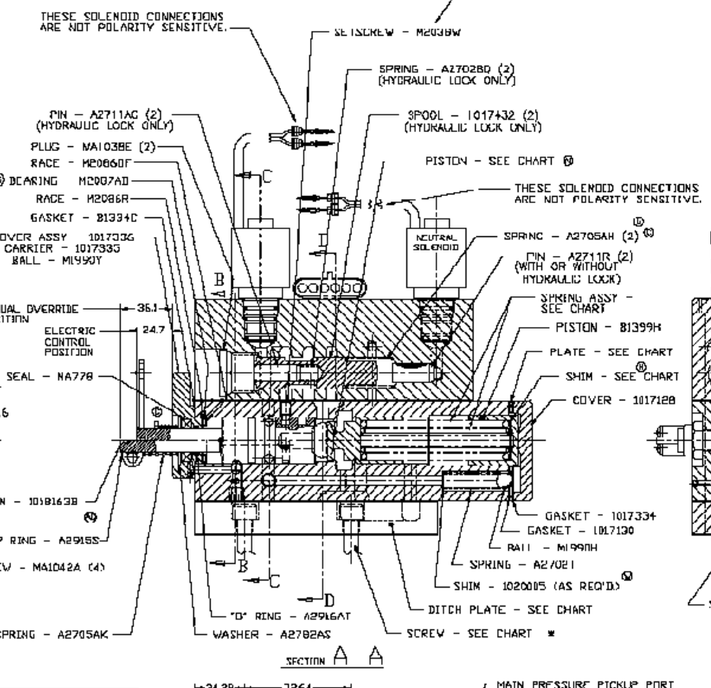
TOP VIEW

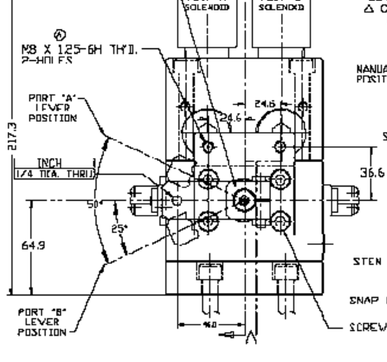
NOTE:
SECURE LEVER IN THE DEPRESSED "ELECTRIC CONTROL MODE" POSITION BY CRIMPING PLASTIC STRAP THRU 1/4" HOLE IN LEVER & M8 THREADED HOLE BEHIND - PULL TIGHT, TRIM END SHORT.

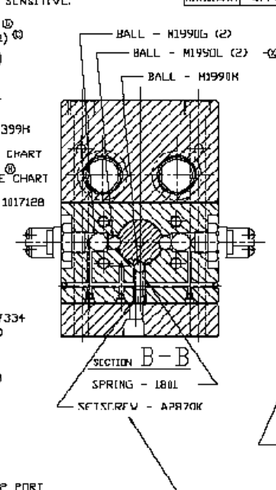


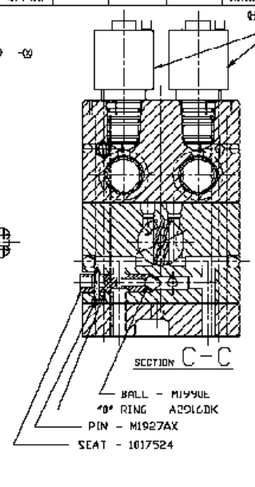
NOTE:
INSTALL USING MA90B LOCTITE #242). THREAD END POINT INTO DETENT GROOVE UNTIL SNUG. BACK-OFF 1/2 TURN.

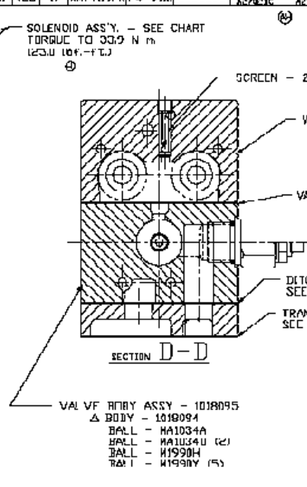
THESE SOLENOID CONNECTIONS ARE NOT POLARITY SENSITIVE.

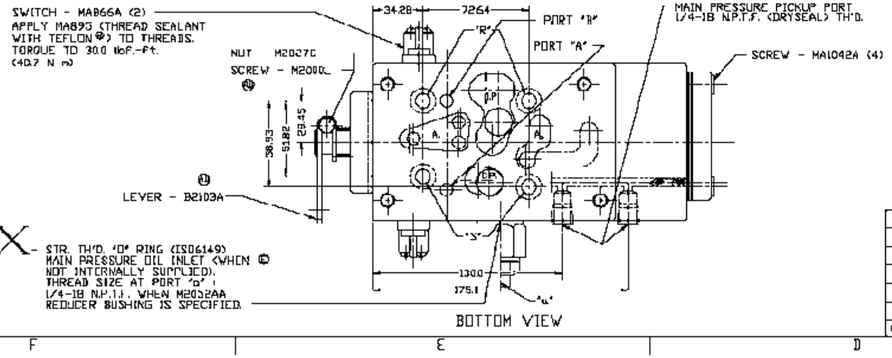





BALL - M1990G (2)
BALL - M1990L (2)
BALL - M1990K
SECTION B-B
SPRING - 1801
SETSCREW - A2872K
NOTE:
INSTALL USING MA90B LOCTITE #242) TOP OF SCREW MUST BE FLUSH WITH SURFACE.




SCREEN - 221338
VALVE BODY ASSY. - 1017444
A BODY - 1017443
A BODY - MA1034A (11)
BALL M1990Y (6)
VALVE GASKET - 1017136B
DITCH PLATE GASKET - SEE CHART *
TRANSMISSION GASKET - SEE CHART *
SECTION D-D
VALVE BODY ASSY - 1018095
A BODY - 1018094
BALL - MA1034A
BALL - MA1034U (2)
BALL - M1990H
BALL - M1990Y (5)



X - STR. TH'D. 'O' RING (ISO6149) MAIN PRESSURE OIL INLET (WHEN NOT INTERNALLY SUPPLIED). THREAD SIZE AT PORT 'A' 1/4-18 N.P.T.F. WHEN M2032AA REDUCER BUSHING IS SPECIFIED.

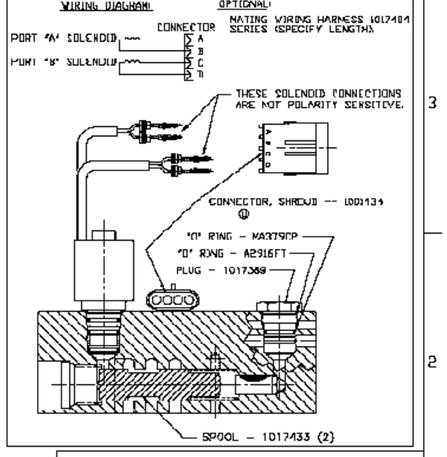
	VALVE ASS'Y NO.	BDN NO.	DITCH PLATE NO.	PITCH PLATE GASKET	TRANSMISSION GASKET	PISTON	ANTI-ROTATION LOCKING	SOLENOID QTY.	SOLENOID No.	VOLTAGE	VALVE SPRINGS SPRING ASS'Y	VALVE SPRINGS PINION "A" OUTER	VALVE SPRINGS PINION "A" INNER	CLUTCH PRESS. RANGE NOM.	ORIFICE PLATE No.	X	SHIMS PART NO.	SHIMS THICK. QTY.	MOUNTING SCREWS "R"	MOUNTING SCREWS QTY.	MOUNTING SCREWS "S"	MOUNTING SCREWS QTY.	FIRST USE	DATE AND APPR.
(M) (A)	1018084	40750	1017133	1017134	BL337F	1018688	YES	3	XM2759FW	24 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129B	MA1038E<027 X 2.8-6H	B2451B	MA1052A	2	MA1052A	2	MG-5202DC	2-27-98 JDK/BJL
	1018084A	40751	-------	1017383	-------	1017379	NO	2	XM2759FW	24 VDC	-------	A2707BD	A2704BU	2415 (350)	1017129A	MA1038E<027 X 2.8-6H	B2451B	-------		-------		MG-6519RV	3-27-98 SAS/BJL
(A)	1018084B	40752	1017133	1017134	BL337F	1017379	NO	2	XM2759FW	24 VDC	-------	A2707AD		1585 (230)	1017129A	MA1038E<027 X 2.8-6H	B2451B	M2089F	2	M2089AG	2	M2089AQ	2-27-98 SAS/BJL
	1018084C	40753	1017133	1017134	BL337F	1017379	NO	2	XM2759FW	24 VDC	XA2707BZ	A2707BW	A2703BA	1380 (200)	1017129	M2051L M2052AA	DC451D	M2089Y	1	M2089F	3	DD-316V	2-27-98 SAS/BJL
(AA)	1018084D	40754	1017133	1017134	BL337F	1017379	NO	2	XM2759FW	32 VDC	-------	A2707AD		1585 (230)	1017129A	M2051L M2052AA	B2451B	M2089F	2	M2089AG	2	DD-316V	2-27-98 SAS/BJL
	1018084E	40755	1017133	1017134	BL337F	1017379	NO	2	XM2759FW	32 VDC	XAP707BZ	AP707BW	AP703BA	1380 (200)	1017129	M2051L M2052AA	B2451B	NP089Y	1	NP089F	3	DD-316V	2-27-98 SAS/BJL
(AA)	1018084F	40756	1017133A	1017134	BL337F	1018688	NO	2	XM2759FW	24 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129A	MA1038E<027 X 2.8-6H	B2451B	M2089F	2	M2089F	2	MG-5311	2-27-98 SAS/BJL
(AA)	1018084G	40757	1017133A	1017134	BL337F	1018688	NO	2	XM2759FW	32 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129A	MA1038E<027 X 2.8-6H	B2451B	M2089F	2	M2089F	2	MG-5311	2-27-98 SAS/BJL
(AA)(AE)	1018084H	40758	1017583	1017569	1017613	1018688	NO	2	XM2759FW	24 VDC	XA2707Z	A2707Z	A2703T	2800 (290)	1017129B	MA1038E<027 X 2.8-6H	B2451B	MA1052B	2	MA1052B	2	MG-5311	2-27-98 SAS/BJL
(AA)(AE)	1018084J	40761	1017583	1017569	1017613	1018688	NO	2	XM2759FW	32 VDC	XA2707Z	A2707Z	A2703T	2800 (290)	1017129B	MA1038E<027 X 2.8-6H	B2451B	MA1052B	2	MA1052B	2	MG-5311	2-27-98 SAS/BJL
(M)	1018084K	40762	1017133A	1017134	BL337F	1017379	NO	2	XM2759FW	24 VDC	-------	A2707AD		1585 (230)	1017129A	MA1038E<027 X 2.8-6H	B2451B	MA1052B	2	MA1052B	2	MG-5314	2-27-98 SAS/BJL
(AA)	1018084L	40763	1017133A	1017134	BL337F	1017379	NO	2	XM2759FL	32 VDC	-------	A2707AD		1585 (230)	1017129A	MA1038E<027 X 2.8-6H	B2451B	MA1052B	2	MA1052B	2	MG-5314	2-27-98 SAS/BJL
(E)	1018084M	40764	-------	1017383	-------	1018688	NO	2	XM2759FW	24 VDC	-------	A2702BC A2717BD	A2704BU	2415 (350)	1017129A	MA1038E<027 X 2.8-6H	B2451B	-----		-----		MG-5984	2-27-98 SAS/BJL
(AE)(AD)	1018084N	40765	1017583	1017569	1017613	1018688	NO	2	XM2759FW	24 VDC	XA2707Z	A2707Z	A2703T	2800 (290)	1017129B	MA1038E<027 X 2.8-6H	B2451B	MA1052B	2	MA1052B	2	MG-5311	2-27-98 SAS/BJL
(AE)(AD)	1018084P	40766	1017583	1017569	1017613	1018688	NO	2	XM2759FW	24 VDC	XA2707Z	A2707Z	A2703T	2800 (290)	1017129B	MA1038E<027 X 2.8-6H	B2451B	MA1052B	2	MA1052B	2	MG-5311	2-27-98 SAS/BJL
(AE)(AD)	1018084Q	40767	1017583	1017569	1017613	1018688	NO	2	XM2759FW	24 VDC	XA2707Z	A2707Z	A2703T	2800 (290)	1017129B	MA1038E<027 X 2.8-6H	B2451B	MA1052B	2	MA1052B	2	MG-5311	2-27-98 SAS/BJL
(AA)	1018084R	40768	1017133A	1017134	BL337F	1018688	NO	2	XM2759FW	24 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129A	MA1038E<027 X 2.8-6H	B2451B	MA1052B	2	MA1052B	2	MG-5311	2-27-98 SAS/BJL
(AA)	1018084S	40769	1017133A	1017134	BL337F	1018688	NO	2	XM2759FW	24 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129A	MA1038E<027 X 2.8-6H	B2451B	MA1052B	2	MA1052B	2	MG-5311	2-27-98 SAS/BJL
(AA)	1018084T	40770	1017133A	1017134	BL337F	1018688	NO	2	XM2759FW	24 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129A	MA1038E<027 X 2.8-6H	B2451B	MA1052B	2	MA1052B	2	MG-5311	2-27-98 SAS/BJL
(AA)	1018084U	40771	1017133A	1017134	BL337F	1018688	NO	2	XM2759FW	24 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129A	MA1038E<027 X 2.8-6H	B2451B	MA1052B	2	MA1052B	2	MG-5311	2-27-98 SAS/BJL
(AA)	1018084V	40772	1017133A	1017134	BL337F	1018688	NO	2	XM2759FW	24 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129A	MA1038E<027 X 2.8-6H	B2451B	MA1052B	2	MA1052B	2	MG-5311	2-27-98 SAS/BJL
(AA)	1018084W	40773	1017133A	1017134	BL337F	1018688	NO	2	XM2759FW	24 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129A	MA1038E<027 X 2.8-6H	B2451B	MA1052B	2	MA1052B	2	MG-5311	2-27-98 SAS/BJL
(AA)	1018084X	40774	1017133A	1017134	BL337F	1018688	NO	2	XM2759FW	24 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129A	MA1038E<027 X 2.8-6H	B2451B	MA1052B	2	MA1052B	2	MG-5311	2-27-98 SAS/BJL
(AA)	1018084Y	40775	1017583	1017569	1017613	1018688	NO	2	XM2759FW	24 VDC	XA2707Z	A2707Z	A2703T	2800 (290)	1017129B	MA1038E<027 X 2.8-6H	B2451B	MA1052B	2	MA1052B	2	MG-5311	2-27-98 SAS/BJL
(AA)	1018084Z	41045	-------	1017134	-------	1018688	NO	2	XM2759FW	24 VDC	XA2707AD	A2707AD	A2703AB	2800 (290)	1017129B	MA1038E<027 X 2.8-6H	B2451B	-----		-----		MG-5311	2-27-98 SAS/BJL
(Z)	1018084AA		1017583	1017569	1017613	1018688	NO	2	XM2759FW	24 VDC	XA2707Z	A2707Z	A2703T	2800 (290)	1017129B	MA1038E<027 X 2.8-6H	B2451B	MA1052B	2	MA1052B	2	MG-5311	2-27-98 SAS/BJL
(AA)	1018084AB	41093	1017133	1017134	BL337F	1018688	NO	2	XM2759FW	32 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129B	MA1038E<027 X 2.8-6H	B2451B	MA1052A	2	MA1052A	2	MG-5202DC	3-23-98 JDK/BJL
(AA)	1018084AC	40967	-------	1017383	-------	1017379	YES	3	XM2759FW	24 VDC	-------	A2702BC A2717BD	A2704BU	2415 (350)	1017129A	MA1038E<027 X 2.8-6H	B2451B	-----		-----		MG-6449-RV	7-26-99 JDK/BJL
(AA)(AE)	1018084AD	41114				1018688	NO	2	XM2759FW	24 VDC	-------	A2702BC A2717BD	A2704BU	2415 (350)	1017129B	MA1038E<027 X 2.8-6H	DC451D	-----		-----		MG 6446SC	8-6-99 JDK/BJL
(AA)(AE)	1018084AE	41115				1018688	NO	2	XM2759FW	24 VDC	-------	A2702BC A2717BD	A2704BU	2415 (350)	1017129B	MA1038E<027 X 2.8-6H	B2451B	-----		-----		MG-6446SC	8-6-99 JDK/BJL
(AA) (AA)	1018084AF	41118	1017133	1017134	BL337F	1018688	NO	2	XM2759FW	32 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129B	MA1038E<027 X 2.8-6H	B2451B	MA1052K	2	MA1052K	2	MG-5202SC	3-23-98 JDK/BJL
(AA)	1018084AG	41163		1017134		1018688	NO	2	XM2759FW	32 VDC	XA2707AD	A2707AD	A2703AB	2800 (290)	1017129B	MA1038E<027 X 2.8-6H	B2451B					MG-5203DC	10-29-98 JDK/BJL
(M)	1018084AH	41171				1018688	NO	2	XM2759FW	24 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129B	MA1038E<027 X 2.8-6H	DC451D					MG 5170DC	11-18-98 JDK/BJL
(M)	1018084AJ	41172				1018688	NO	2	XM2759FW	32 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129B	MA1038E<027 X 2.8-6H	B2451B					MG-5170DC	11-18-98 JDK/BJL
(AA)(AA)	1018084AK	41244	1018584	1018594	B3117A	1018688	NO	2	XM2759FW	32 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129A	MA1038E<027 X 2.8-6H	B2451B	MA1732AH	2	MA1732AH	2	MG-540	6/21/00 JDK/BJL
(M)	1018084AL	41230	-------	-------	-------	1018688	NO	2	XM2759FW	24 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129A	MA1038E<027 X 2.8-6H	B2451B	-----		-----		MG-520-JHP	2/21/00 ALC/BJL
(AA)	1018084AM	41231	-------	-------	-------	1018688	NO	2	XM2759FW	32 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129A	MA1038E<027 X 2.8-6H	B2451B	-----		-----		MG-520-JHP	2/21/00 ALC/BJL
(AA)	1018084AN	41196	-------	-------	-------	1017379	NO	2	XM2759FW	24 VDC	-------	A2707AD	A2703BA	1860 (270)	1017129A	MA1038E<027 X 2.8-6H	B2451B	-----		-----		MG-5141SC	3/27/01 ALC/BJL
(AA)	1018084AP	41195	-------	-------	-------	1017379	NO	2	XM2759FW	32 VDC	-------	A2707AD	A2703BA	1860 (270)	1017129A	MA1038E<027 X 2.8-6H	B2451B	-----		-----		MG-5141SC	3/27/01 ALC/BJL
(M) (M)	1018084AQ	41337	-------	1017383	-------	1017379	YES	3	XM2759FW	24 VDC	-------	A2702BC A2717BD	A2704BU	2030 (140)	1017129B	MA1038E<027 X 2.8-6H	B2451B	-----		-----		MG-6525	4/27/00 JDK/BJL
(M)	1018084AR	41446	-------	1017383	-------	1017379	YES	3	XM2759FW	24 VDC	-------	A2702BC A2717BD	A2704BU	2430 (330)	1017129A	MA1038E<027 X 2.8-6H	B2451B	-----		-----		MG-6608 MG-6619	6/21/00 JDK/BJL
	1018084AS	41719				1018688	YES	3	XM2759FW	24 VDC	XA2707Z	A2707Z	A2703T	1725 (250)	1017129A	MA1038E<027 X 2.8-6H	DC451D	-----		-----		MG-5170DC	4/16/01 JDK/BJL
	1018084AT	42206	-------	-------	-------	1018688	YES	3	XM2759FW	24 VDC	-------	A2702BC A2717BD	A2704BU	2415 (350)	1017129B	MA1038E<027 X 2.8-6H	B2451B	-----		-----		MG-5840SC	10-30-01 JDK/BJL

USE AS REQUIRED

PARTS FOR UNITS WITHOUT NEUTRAL SOLENOID AND HYDRAULIC LOCK (OPTIONAL CONDITION)

WIRING DIAGRAM:

OPTIONAL:
MATING WIRING HARNESS 1017484 SERIES (SPECIFY LENGTH)



A_1 = ATMOSPHERIC PRESSURE
A_P = ATMOSPHERIC PRESSURE
I.P. = INTERMEDIATE PRESSURE
C.P. = CLUTCH PRESSURE

(A) OBSOLETE FOR PRODUCTION AND SERVICE

△ NOT SERVICEABLE SEPARATELY

* THESE PARTS ARE TO BE PACKAGED SEPARATELY AND SHIPPED WITH UNIT.

HYDRAULIC DIAGRAM A7119W, SHEET 1 OF 2

METRIC

THIRD ANGLE PROJECTION

SIMILAR TO

REV	ZONE	CH. NO.	DATE
AH		ECN10970	8-9-02
AG		ECN10415	1-11-02
AF	A-4,5	ECN10553	12-3-11

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MATERIAL: ---------
HEAT TREAT

WEIGHT: LB / N

FIRST USE: ASSY. 1018287 NOTE: MG-5202DC

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MM; MACHINED DIMENSIONS X .X ±0.38, X.XX ±0.05, X.XXX ±0.013; ALL ANGULAR TOLERANCES ±1° GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE: 3-23-98
SCALE: .150 - 1.00
DRN.: RM
CHK.: KRM/BJL
APPD.: TAS

NAME: VALVE ASS'Y. - CONTROL (WITHOUT TROLLING VALVE)

TWIN DISC INCORPORATED RACINE, WI 53403 - USA

10180084 SERIES

SHEET 1 OF 1 | REV AH

VALVE ASS'Y No.	BOM No.	TROLLING VALVE ASS'Y	HYD HAULG LOCK†	SOLENOID QTY.	SOLENOID No.	VOLTAGE	COMMENT	FIRST USE	DATE AND APPR.
1020025	41492	1-68753-G	NO	2	XM2759FN	24 VDC	--------	MG-6557SC	9-21-00 AJC/BJE
1020025A	41513	1-68753-G	YES	3	XM2759FN	24 VDC	--------	MG-6557SC	9-29-00 AJC/BJE
1020025B	41514	1-68753-G	YES	3	XM2759FN	24 VDC	SEE SEPARATE DWG	MG-6557/6619 W/HYD. PTO	10-3-00 AZ/ALC

WIRING DIAGRAM:

CONNECTOR

PORT "A" SOLENOID — A

PORT "B" SOLENOID — B, C

NEUTRAL SOLENOID — D, E, F

OPTIONAL:

MATING WIRING HARNESS 1017403 SERIES (SPECIFY LENGTH).

* HOSE – MA923AN

* ADAPTER – 1018370

245.0

24.0

(USE ONE COPPER SEALING WASHER FROM EXISTING BANJO UNION HERE.)

SCREW – MA961Y (2)

SCREW – MA1052S (4) (TORQUE TO 54 N-m)

CLIP – 1017322

CONNECTOR, SHROUD – 1001825 ®

PLATE – 1018312

SCREW – MA961T

430.6 APPROXIMATE

SCREW – MA961U

TEE – MA711G

VALVE ASS'Y. – SEE CHART

TOP VIEW

SOLENOID ASS'Y. – SEE CHART (TORQUE TO 34 N-m)

SCREEN – 221336

SECTION A–A

THESE SOLENOID CONNECTIONS ARE NOT POLARITY SENSITIVE.

PIN – A2711AC (2) (HYDRAULIC LOCK ONLY)

PLUG – MA1038E (2)

SCREW – MA1052J (4) (TORQUE TO 54 N-m) *

SPRING – A2702BQ (2) (HYDRAULIC LOCK ONLY)

SPOOL – 1017432 (2) (HYDRAULIC LOCK ONLY)

SPRING – A2705AH (2)

PIN – A2711R (2) (WITH OR WITHOUT HYDRAULIC LOCK)

PORT "A" SOLENOID

PORT "B" SOLENOID

NEUTRAL SOLENOID

GASKET – 1-68405-B

PLUG – M2051L (2)

GASKET – 1017136B (2) *

237.1

VALVE BODY ASS'Y–1017444A
△ BODY–1017443A
BALL–MA1034A (11)
BALL–M1990Y (6)

PLATE – 1018364

GASKET 1018365

PLATE – 1018366

GASKET – 1018367

PLATE 1018368

* GASKET – 1017383

SECTION B–B

MAIN PRESSURE PICKUP PORT 1/4–18 N.P.T.F. (DRYSEAL) THD.

OIL TEMPERATURE PICKUP PORT 1/4–18 N.P.T.F. (DRYSEAL) THD

* PLUG – M2051L

REDUCER – M2052AA

* TEE – MA711C

* ADAPTER – MA1053G

THIS KIT FOR USE WITH EXISTING LOWER VALVE AS–INSTALLED ON TRANSMISSION

△ NOT SERVICEABLE SEPARATELY

* THESE PARTS ARE TO BE PACKAGED SEPARATELY AND SHIPPED WITH UNIT.

HYDRAULIC DIAGRAM– A7119Z

PARTS FOR UNITS WITHOUT NEUTRAL SOLENOID AND HYDRAULIC LOCK (OPTIONAL CONDITION)

WIRING DIAGRAM:

CONNECTOR

PORT "A" SOLENOID — A

PORT "B" SOLENOID — B, C, D

OPTIONAL:

MATING WIRING HARNESS 1017404 SERIES (SPECIFY LENGTH).

THESE SOLENOID CONNECTIONS ARE NOT POLARITY SENSITIVE.

CONNECTOR, SHROUD – 1001434

"O" RING – MA379CP

"O" RING – A2916FT

PLUG – 1017389

SPOOL – 1017433 (2)

REV	ZONE	DESCRIPTION	DATE
B	B5	30380	10-12-00
A	--	30332	10-5-00

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METRIC

DRAWN DB-21-00

CHECKED 1.00±1.00

APPV AZ

DES. ALC

APPR. BJE

TWIN DISC INCORPORATED RACINE, WISCONSIN U.S.A.

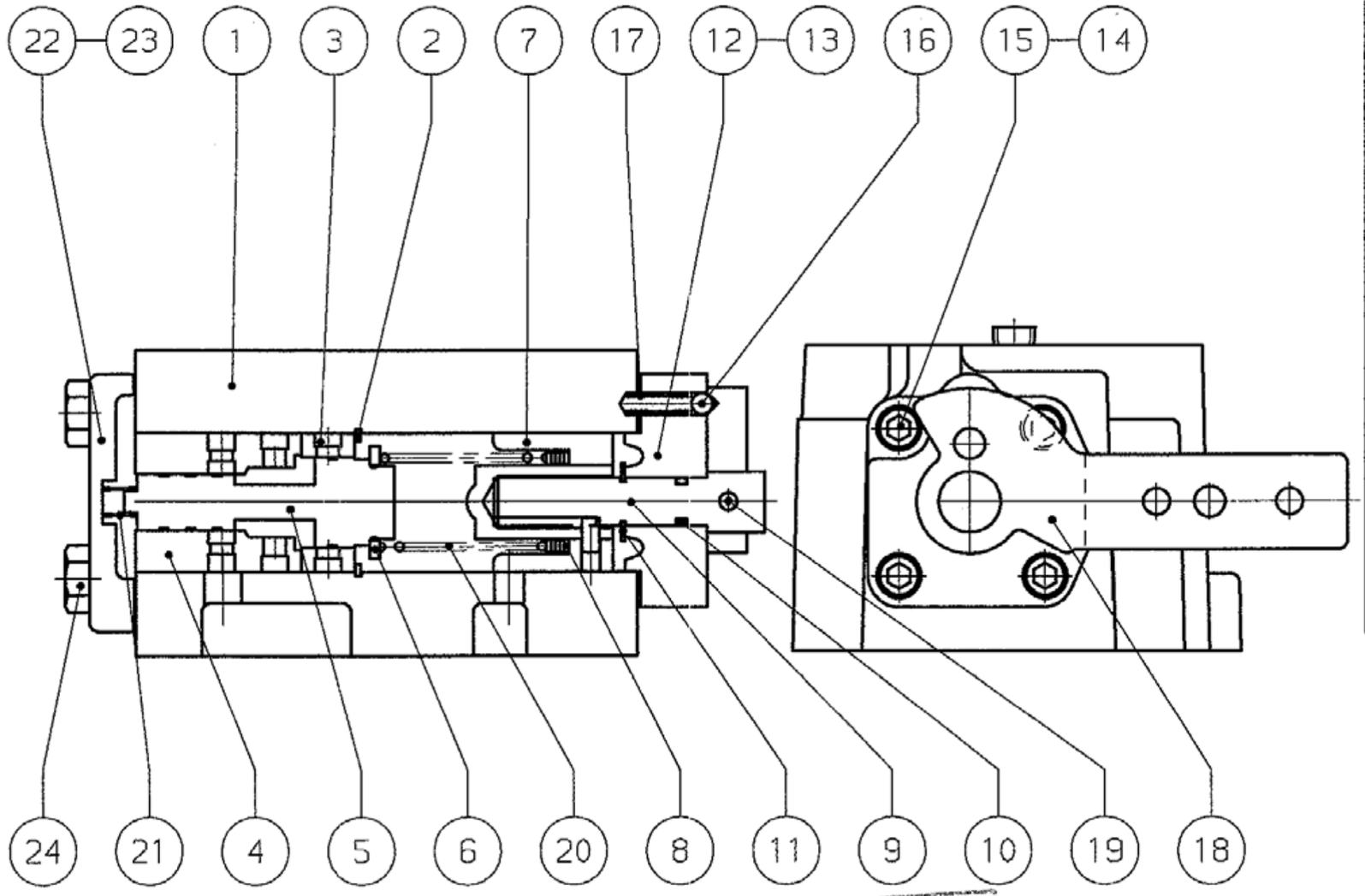
1020025

VALVE ASS'Y. – CONTROL (TROLLING VALVE FIELD INSTALLATION)

SHEET 1 OF 1 REV B

6 5 4 3 2 1

E D C B A



ITEM	PARTS NO.	N A M E	Q'TY	REMARKS
1	1-68438-A	VALVE AS	1	
2	N058003200	RING, SNAP	1	
3	1-52546	BUSH	1	
4	1-52545-E	BUSH	1	
5	1-52540-B	PISTON	1	
6	1-9241-KY	WASHER	1	
7	1-53608-E	PISTON AS.	1	
8	1-51080	SHIM	5	
9	1-50864-C	SHAFT, TROLLING VALVE	1	
10	N048002049	RING, "O"	1	
11	N083009000	RING, E TYPE SNAP	1	
12	1-12942	COVER	1	
13	1-12948-C	GASKET	1	
14	N113806030	SCREW, SOCKET HEAD	2	
15	N113806020	SCREW, SOCKET HEAD	2	
16	N131004762	BALL, STEEL	1	
17	N050005023	SPRING	1	
18	1-50863-D	HANDLE	1	
19	N075040020	PIN, ROLL	1	
20	K175022027	SPRING	1	
21	N175009004	SPRING	1	
22	1-54665-C	COVER	1	
23	1-61158-D	GASKET	1	
24	N085708025	SCREW, HEX.HEAD	4	

SYMBOL	DESCRIPTION	CHANGE NO.	DATE	SIGNATURE	APPROVED
		*******			
		*******			
		*******			
		*******			

REVISIONS

ISSUED
KAMO PLANT
2000 SEP 20
NIIGATA CONV... CO.,LTD.
KAMO

APPROVED K. Ishizawa	MATERIAL -	MODEL MG6984SC
CHECKED /	HEAT TREATMENT - -	NAME VALVE, TROLLING AS.
DESIGNED K. Hayashi		
DRAWN K. HAYASHI	SCALE 1:1.5	3RD ANGLE PROJECTION
DATE 990906		DRAWING NO. 1-68753-G

NIIGATA CONVERTER CO.,LTD.
TOKYO JAPAN

ITEM	PARTS NO.	N A M E	Q'TY	REMARKS
ⓐ 1	1-53114-J	PUMP, TROCHOID	1	
2	1-52905-B	GASKET	1	
ⓐ 3	N113806060	SCREW, SOCKET HEAD	3	
4	1-11017-C	COUPLING, OLDHAM	1	
5	1-77901	MOUNT, PUMP AS.	1	
6	1-77337	GASKET	1	
7	1-54942	STRAINER	1	
8	N048006043	RING, "O"	1	
9	101012-A	VALVE, NONRETURN	1	
10	1-71198-A	GASKET	1	
11	1-77848	PIPING AS.	1	

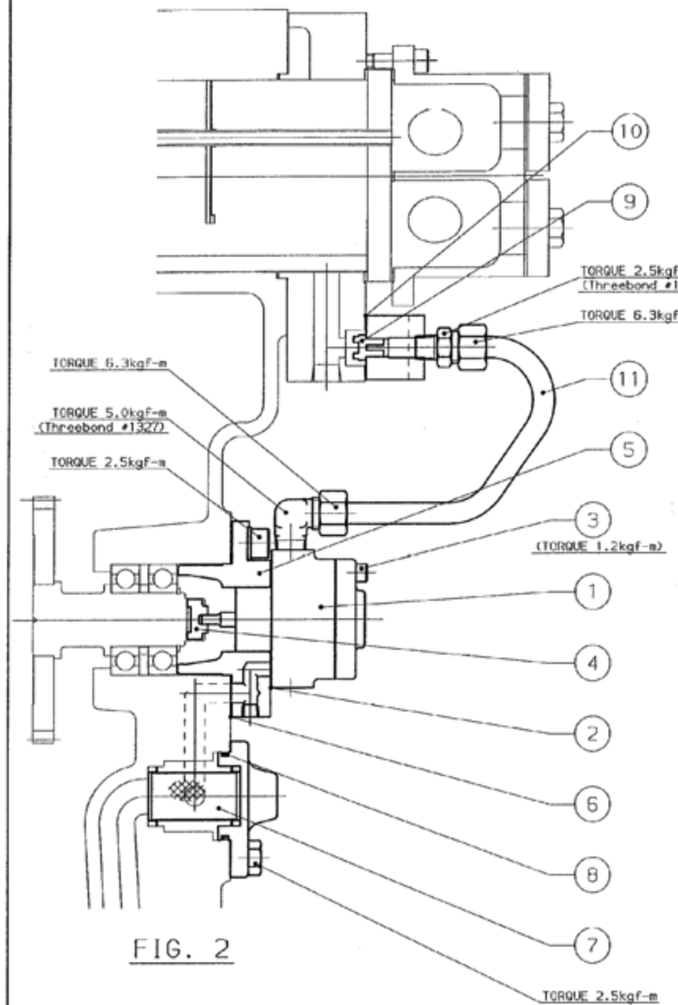
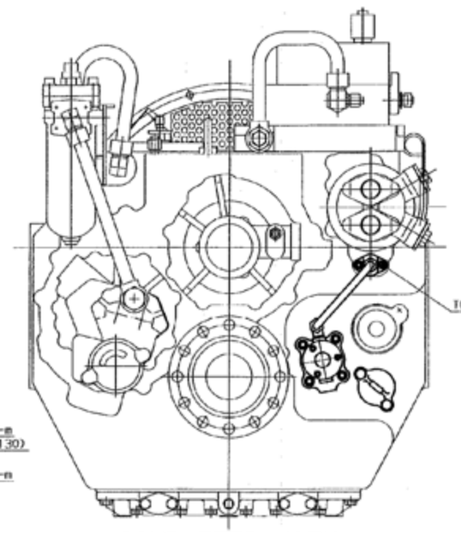


FIG. 2



COMPLETED VIEW

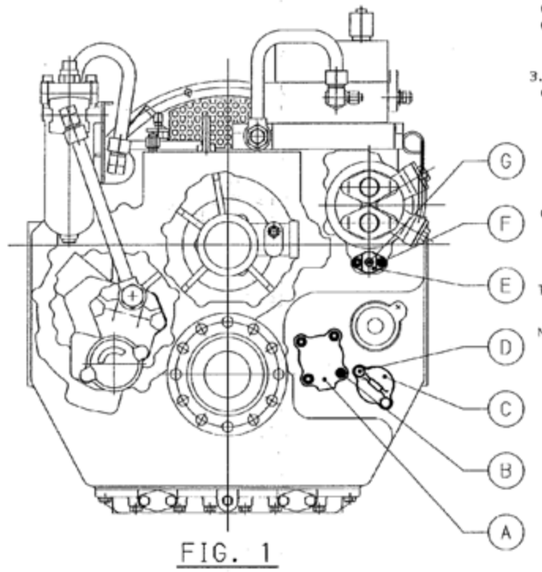


FIG. 1

INSTALLATION WORK SHOULD BE MADE AS PER THE FOLLOWING INSTRUCTIONS.

1. ITEMS TO BE NOTED AT THE INSTALLATION WORK
   (1) CIRCLED FIGURES INDICATE THE ADDITIONAL PARTS FOR THE INSTALLATION WORK. ALPHABETS INDICATE PRE-FITTED PARTS ON THE GEARBOX.
   (2) REFER TO THE ATTACHED FIGURES FOR THE EXACT INSTALLATION. TAKE CARE TO MATCH THE PATTERNS OF GASKETS WITH THOSE OF THE PARTS TO BE ATTACHED.
   (3) BEFORE THE INSTALLATION, REMOVE THE DUST FROM THE PARTS BY OIL WASHING AND AIR BLOWING.
   (4) WHEN THE PIPING ARE HARD TO INSTALL, TRY AGAIN AFTER ADJUSTING THE LOCATION OF THE BASE PARTS BY LOOSING THEIR SCREWS.

2. REMOVAL OF THE PRE-FITTED PARTS (REFER TO FIG. 1)
   (1) REMOVE COVER Ⓐ, Ⓒ AND FLANGE Ⓔ.
   (2) REMOVE PLUG Ⓖ FROM FLANGE Ⓔ.
   (3) KEEP SCREW ⒷⒹⒻ, COVER Ⓒ AND FLANGE Ⓔ FOR REUSE AT THE INSTALLATION OF THE TRAILING PUMP KIT.

3. INSTALLATION OF TRAILING PUMP (REFER TO FIG. 2)
   (1) INSTALLATION OF TRAILING PUMP
      A. ATTACH THE PUMP BASE Ⓢ WITH GASKET Ⓐ BY SCREWS Ⓑ.
      B. ATTACH THE OLDHAM COUPLING ④ TO THE SHAFT. INSTALL THE GASKET ② AND PUMP ① BY SCREWS ③. IN THIS WORK, MAKE SURE THAT THE HOLE OF THE GASKET MEETS THE HOLE OF THE PUMP BASE.
   NOTE,
   USE GREASE DURING THE OLDHAM COUPLING AND THE SHAFT TO PREVENT THE COUPLING FALL.
   (2) ASSEMBLY OF NONRETURN VALVE
      A. INSERT THE NONRETURN VALVE ⑨ TO FLANGE Ⓔ WITH GASKET ⑩ BY SCREW Ⓕ.
      B. INSTALL THE PIPING ASSEMBLY ⑪ ON THE GEARBOX AS PER FIG. 2.
      C. INSERT THE STRAINER ⑦ TO THE GEARBOX AND INSTALL THE COVER Ⓒ WITH "O"RING Ⓗ

THE INSTALLATION WORK IS COMPLETED.

NOTE: THE STRAINER SHALL BE CLEANED EVERY TIME AT CHANGING OIL.

BOM. NO. 5703158

METRIC

THIRD ANGLE PROJECTION

SIMILAR TO

T.D.I. NICO

REV	BY	APPD.	REV	ZONE	CH. NO.	DATE	REV	ZONE	CH. NO.	DATE
a	T.WATANABE	K.Shigeura	a	B4	MK12149	011122			*******	

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MATERIAL -
HEAT TREAT -
SURFACE TREATMENT

WEIGHT . kg | M² . N·m²

FIRST USE
ASSY.
MODEL MG-6557-00-SC

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X. ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

NAME OPTION KIT (TRAILING PUMP KIT)

DATE 9-27-97
SCALE 1:2
DRN. T.WATANABE
CHK. K.Shigeura
APPD. Y.Ishida

TWIN DISC INCORPORATED RACINE, WI 53403 - USA

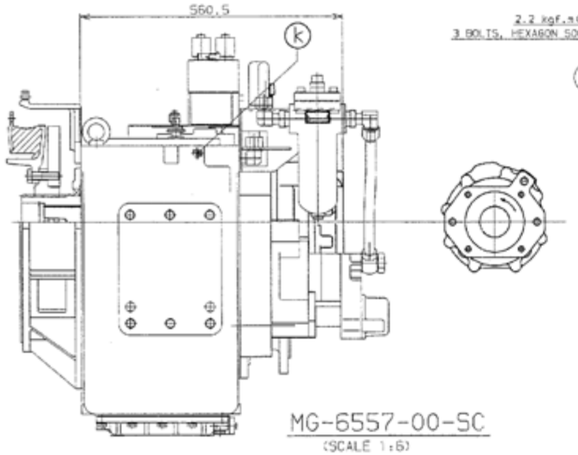
5-49091

SHEET 1 OF 1 | REV ___

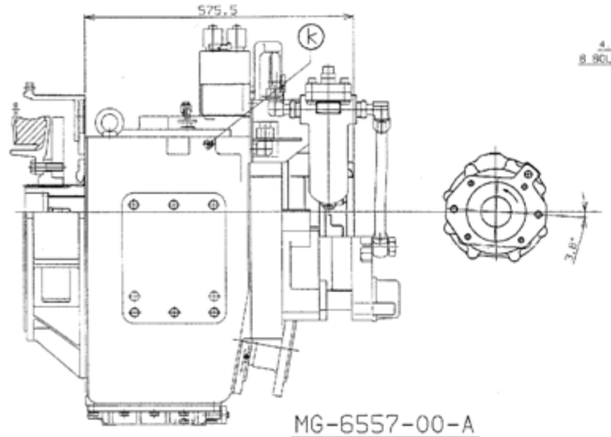
A2T

D C B A

4 3 2 1



MG-6557-00-SC
(SCALE 1:6)



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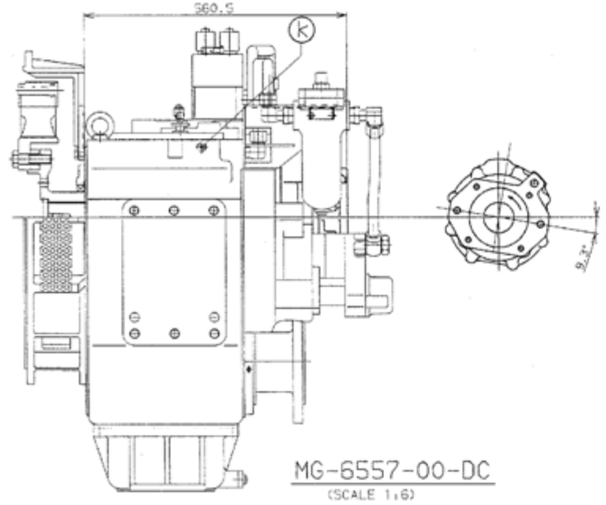
(SCALE 1:6)



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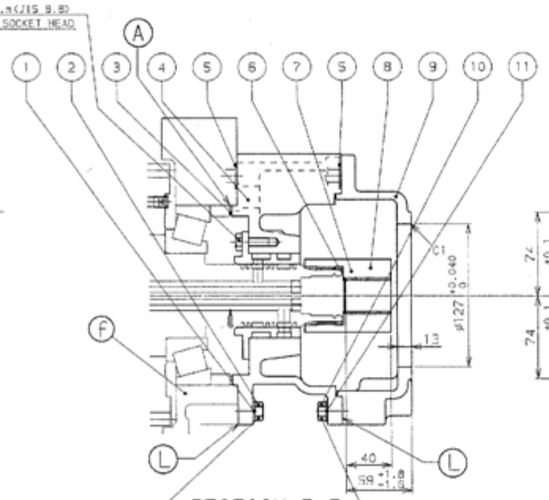
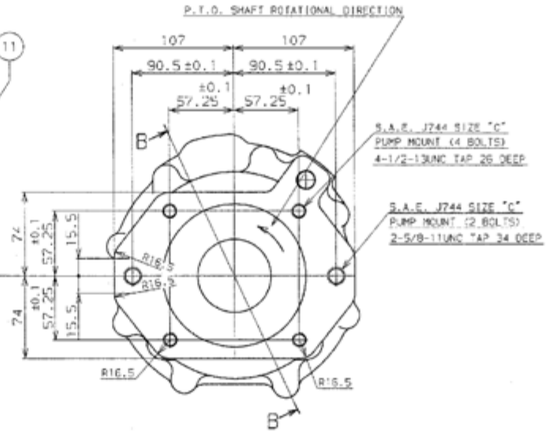
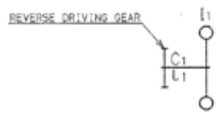


SECTION B-B
FIG 2



MASS ELASTIC SYSTEM



INPUT SHAFT			SLEEVE
C1	L1	d	I1
0.52	0.160	0.048	0.001

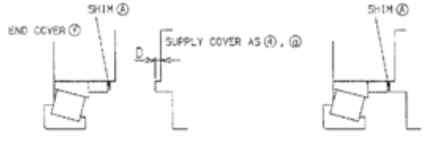
NOTES
1. ALL VALUES WERE CALCULATED.
2. MASS ELASTIC DATA DOSE NOT CONVERT TO ENGINE SPEED.

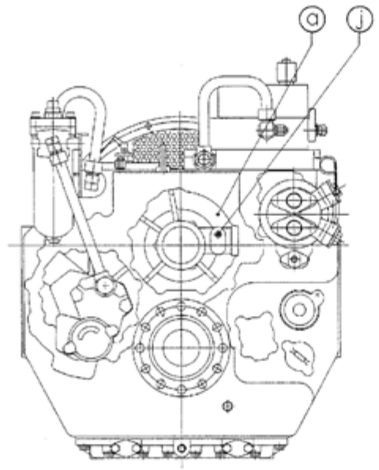
I1: MOMENT OF INERTIA (kg.m²)
C1: TORSIONAL RIGIDITY (MNm/rad)
di: MIN. SHAFT DIA. (m)
Li: ACTUAL SHAFT LENGTH (m)

DIRECTIONS FOR ADJUSTMENT WITH SHIMS
SHIM MUST BE ADJUSTED BEFORE INSTALLING SUPPLY COVER AS, BECAUSE TAPER ROLLER BEARING IS USED FOR THE INPUT SHAFT. A GAP BETWEEN TAPER ROLLER BEARINGS IS ADJUSTED AS FOLLOWS TO BE -0.05~0.05mm.

1. MEASURE THE DIMENSION "D" OF THE REMOVED SUPPLY COVER AS ⓖ, AND SUPPLY COVER AS ④, WHICH IT TRIES TO INSTALL.
2. WHEN THE DIMENSION "D" OF SUPPLY COVER AS ④ WHICH DOES INSTALLATION IS BIGGER THAN THE DIMENSION OF THE REMOVED SUPPLY COVER AS ⓖ, TAKE SHIM ONLY THE DIFFERENCE.
3. WHEN THE DIMENSION "D" OF SUPPLY COVER AS ④ WHICH DOES INSTALLATION IS SMALLER THAN THE DIMENSION OF THE REMOVED SUPPLY COVER AS ⓖ, PUT SHIM ONLY THE DIFFERENCE.

SHIM	PART NO.	REQ	THICKNESS
Ⓐ	N4E020B203	1 SET	(0.1 0.2 0.5 1.0 2.0) mm





BEFORE CHANGE
FIG 1
(SCALE 1:6)

HYDRAULIC P.T.O. PUMP DRIVE SPECIFICATION		
TOTAL WEIGHT	APPROX. 7.5kg	
OIL VISCOSITY	SAE #40 (DON'T USE MULTI-GRADE OIL)	
P.T.O. CAPACITY	MAX. P.T.O. WORKING TORQUE 61kgf.m	
	P.T.O. OPERATING SPEED 600 ~ 1800 rpm	
	P.T.O. SHAFT ROTATION SAME AS ENGINE ROTATION	
	P.T.O. ACCEPTS S.A.E. J744 SIZE "C" PUMP	
SPLINE DATA	DP	12/24
	NO. OF TEETH	14
	NOMINAL PITCH CIRCLE DIA.	20.833
	PRESS. ANGLE	30°
	TIP DIA.	$27.591^{\ 0}_{-0.021}$
	ROOT DIA.	$31.785^{\ 0}_{-0.034}$
	ARC TOOTH SPACE	$3.325^{+0.043}_{+0.003}$

ITEM	PARTS NO.	N A M E	Q'TY	REMARKS
1	N032010000	WASHER	8	
2	N087710035	SCREW, HEX.HEAD	8	
3	N460208203	SHIM	1 SET	
4	1-77859-2	COVER AS., SUPPLY	1	
5	N048002055	RING, "O"	6	
6	N058002800	RING, SNAP	1	
7	3-49410	SLEEVE	1	
8	1-77182-A	SLEEVE AS., PUMP	1	⑤, ⑦
9	1-78026	COVER AS.	1	
10	N087710035	SCREW, HEX.HEAD	8	
11	N032010000	WASHER	8	

LIVE P.T.O. INSTALLATION PROCEDURE
PAY ATTENTION TO THE FOLLOWING ITEMS WHEN MODIFYING THE MARINE GEAR

- THROUGHOUT THE INSTRUCTIONS, A CIRCLED NUMBER INDICATES A NEWLY REQUIRED PART AND A CIRCLED LETTER INDICATES A PART TO BE REUSED OR A MARINE GEAR PART.
- AS WELL AS PAYING ATTENTION SO THAT DIRT DOES NOT BECOME ATTACHED TO THE MACHINE OR PIPING, BEFORE THE INSTALLATION, WASH IN CLEANING OIL AND DRY WITH COMPRESSED AIR.
- ALTHOUGH THE PIPING HAS BEEN MANUFACTURED IN LINE WITH THE DIMENSIONS BETWEEN THE MACHINES, IF THERE IS ANY DIFFICULTY WHEN INSTALLING THE PIPING, LOOSEN THE INSTALLATION BOLTS AND READJUST THE POSITION BEFORE COMPLETING THE INSTALLATION.
- TIGHTEN THE INSTALLATION BOLTS SUFFICIENTLY SO THAT THERE ARE NO OIL LEAKS. (THE INSTALLATION BOLT TIGHTENING TORQUES ARE SHOWN IN THE DRAWINGS.)
- APPLY GREASE WHEN ASSEMBLING THE O-RING.

1. REMOVEING THE MARINE GEAR PARTS
   1) REMOVE THE SUPPLY COVER AS ⓐ (REFER TO FIG.1) AT THAT TIME, REMOVE ALSO THE ADAPTER ⓙ. THEN INSTALL ITS ADAPTER ⓙ IN POSITION Ⓚ (HOUSING)
2. INSTALLATION THE P.T.O.PARTS
   SINCE THREEBOND WILL BE APPLIED TO THE SURFACE Ⓛ TO WHICH THE SUPPLY COVER AS ④ AND COVER AS ⓖ WILL BE INSTALLED, ENSURE THAT IT IS CLEAN.
   1) BEFORE INSTALLING THE SUPPLY COVER AS ④, READJUST THE SHIM SO THAT THE GAP IS -0.05 ~ +0.05mm. (REFER TO FIG.2)
   2) APPLY THREEBOND (#1211) TO THE END COVER Ⓕ TO WHICH THE O-RING Ⓢ WILL BE ASSEMBLED, AND INSTALL THE SUPPLY COVER AS ④.
   3) INSTALL THE SLEEVE PUMP Ⓑ TO THE SPLINE OF THE DRIVE SHAFT.
   4) APPLY THREEBOND (#1211) TO THE SUPPLY COVER AS ④ TO WHICH THE O-RING Ⓢ WILL BE ASSEMBLED, AND INSTALL THE COVER AS ⓖ.

NOTE : 1. FIGURES IN THE DRAWING SHOW TIGHTENING TORQUE FOR MAIN IMPORTANT BOLTS.
2. COAT LIQUID PACKING (THREEBOND #1211) ON THE PORTION MARKED Ⓛ AND ASSEMBLE THEM.
3. ADJUST SPACES Ⓐ FOR EACH SHAFT WITH SHIMS. SPACES Ⓐ SHOULD BE -0.05 ~ 0.05 mm.

OPTION KIT B.O.M. NO. 5Z03159

REV	BY	APPD.

REV	ZONE	CH. NO.	DATE

REV	ZONE	CH. NO.	DATE

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MATERIAL	WEIGHT XXXX kg	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm	DATE 6-25-98
HEAT TREAT	FIRST USE	MACHINED DIMENSIONS X ±0.25 X.X ±0.25 X.XX ±0.13	SCALE 1:2.5
SURFACE TREATMENT	ASSY. NO.-6557-00-SC NO.-6557-00-A MODEL NO.-6557-00-DC	ALL ANGULAR TOLERANCES ±1° GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982	DRN. KASAHARA
	NAME INSTALLATION DRAWING (LIVE PTO AS)		CHK. K. Sato
			APPD. T. Tomiyama

TWIN DISC INCORPORATED RACINE, WI 53403 - USA

7-37004-A

SHEET 1 OF 1 REV ---

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

F E D C B A

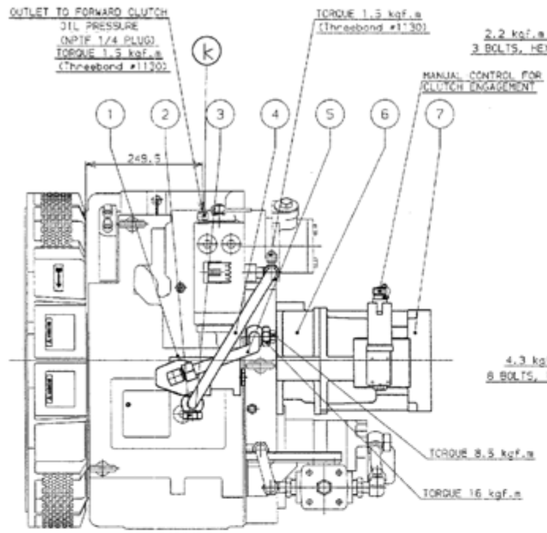
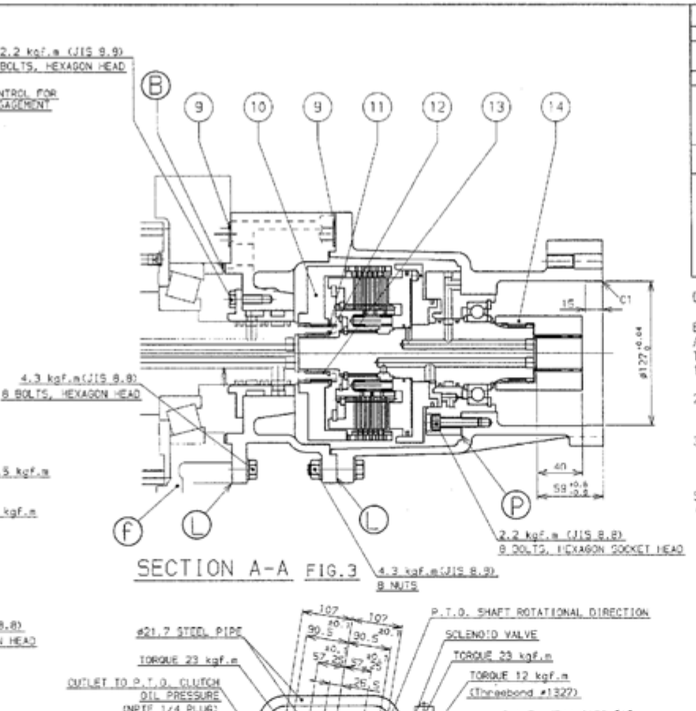
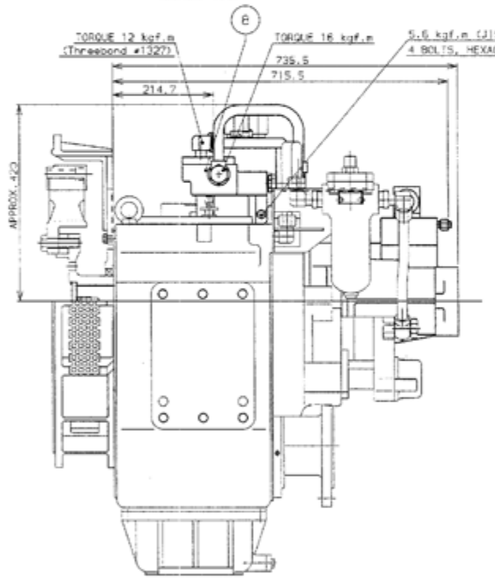
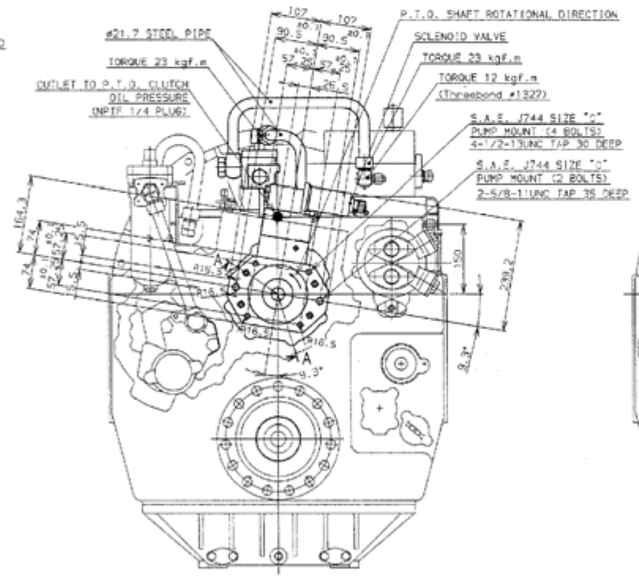

OUTLET TO FORWARD CLUTCH OIL PRESSURE (NPTF 1/4 PLUG) TORQUE 1.5 kgf.m (Threebond #1130)
TORQUE 1.5 kgf.m (Threebond #1130)
MANUAL CONTROL FOR CLUTCH ENGAGEMENT
248.5
TORQUE 8.5 kgf.m
TORQUE 16 kgf.m

FIG.4
(SCALE 1:6)

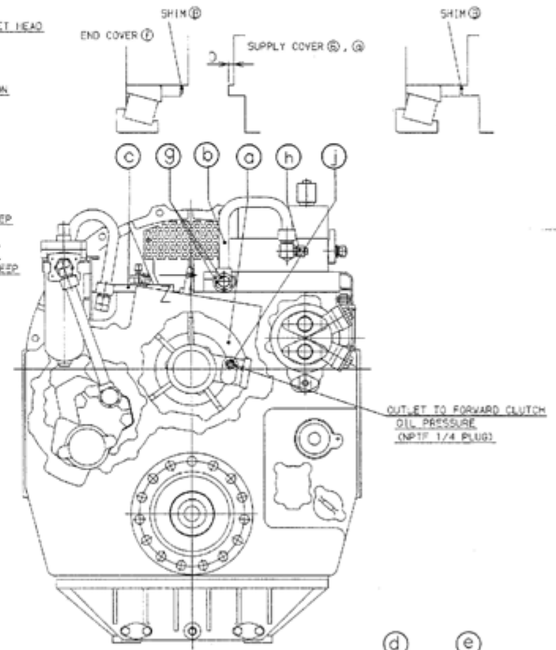

2.2 kgf.m (JIS 8.8) 3 BOLTS, HEXAGON HEAD
4.3 kgf.m(JIS 8.8) 8 BOLTS, HEXAGON HEAD
2.2 kgf.m (JIS 8.8) 8 BOLTS, HEXAGON SOCKET HEAD
4.3 kgf.m(JIS 8.8) 8 NUTS

SECTION A-A FIG.3

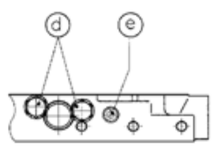




COMPLETED VIEW
(SCALE 1:6)



BEFORE CHANGE FIG.1
(SCALE 1:5)



VIEW Z FIG.2
(SCALE 1:2.5)

HYDRAULIC P.T.O. PUMP DRIVE SPECIFICATION

TOTAL WEIGHT	APPROX. 48 kg	
OIL PRESSURE	CLUTCH OIL 8 ~ 12 kgf/cm²	AT ENGINE SPEED 600-1800 rpm, OIL TEMP. 65~70°C
OIL VISCOSITY	SAE #40 (DON'T USE MULTI-GRADE OIL)	
P.T.O. CAPACITY	MAX. P.T.O. WORKING TORQUE 61kgf.m	
	P.T.O. OPERATING SPEED 600 ~ 1800 rpm	
	P.T.O. SHAFT ROTATION SAME AS ENGINE ROTATION	
	P.T.O. ACCEPTS S.A.E. J744 SIZE "C" PUMP	
SHIFTING RESTRICTION	0.5 X MATCH POINT SPEED	
SPLINE DATA	DP	12/24
	NO. OF TEETH	14
	NOMINAL PITCH CIRCLE DIA.	29.633
	PRESS. ANGLE	30 °
	TIP DIA.	27.591 +0.021 +0.000
	ROOT DIA.	31.785 -0.000 -0.034
	ARC TOOTH SPACE	3.325 +0.059 +0.029

DIRECTIONS FOR ADJUSTMENT WITH SHIMS

SHIM MUST BE ADJUSTED BEFORE INSTALLING SUPPLY COVER AS, BECAUSE TAPER ROLLER BEARING IS USED FOR THE INPUT SHAFT. A GAP BETWEEN TAPER ROLLER BEARINGS IS ADJUSTED AS FOLLOWS TO BE -0.05~0.05mm.

1. MEASURE THE DIMENSION "D" OF THE REMOVED SUPPLY COVER AS ⓒ, AND SUPPLY COVER AS Ⓔ, WHICH IT TRIES TO INSTALL.
2. WHEN THE DIMENSION "D" OF SUPPLY COVER AS Ⓔ WHICH DOES INSTALLATION IS BIGGER THAN THE DIMENSION OF THE REMOVED SUPPLY COVER AS ⓒ, TAKE SHIM ONLY THE DIFFERENCE.
3. WHEN THE DIMENSION "D" OF SUPPLY COVER AS Ⓔ WHICH DOES INSTALLATION IS SMALLER THAN THE DIMENSION OF THE REMOVED SUPPLY COVER AS ⓒ, PUT SHIM ONLY THE DIFFERENCE.

SHIM	PART NO.	REQ	THICKNESS
Ⓟ	N460206203	1 SET	(0.1 0.2 0.5 1.0 2.0)mm

P.T.O. INSTALLATION PROCEDURE

USE THE FOLLOWING PROCEDURE TO MODIFY THE MARINE GEAR WITHOUT P.T.O. CLUTCH TO THE MARINE GEAR WITH PTO CLUTCH. PAY ATTENTION TO THE FOLLOWING ITEMS WHEN MODIFYING THE MARINE GEAR.

- ※ THROUGHOUT THE INSTRUCTIONS, A CIRCLED NUMBER INDICATES A NEWLY REQUIRED PART AND A CIRCLED LETTER INDICATES A PART TO BE REUSED OR A MARINE GEAR PART.
- ※ AS WELL AS PAYING ATTENTION SO THAT DIRT DOES NOT BECOME ATTACHED TO THE MACHINE OR PIPING, BEFORE THE INSTALLATION, WASH IN CLEANING OIL AND DRY WITH COMPRESSED AIR.
- ※ ALTHOUGH THE PIPING HAS BEEN MANUFACTURED IN LINE WITH THE DIMENSIONS BETWEEN THE MACHINES, IF THERE IS ANY DIFFICULTY WHEN INSTALLING THE PIPING, LOOSEN THE INSTALLATION BOLTS AND READJUST THE POSITION BEFORE COMPLETING THE INSTALLATION.
- ※ TIGHTEN THE INSTALLATION BOLTS SUFFICIENTLY SO THAT THERE ARE NO OIL LEAKS. (THE INSTALLATION BOLT TIGHTENING TORQUES ARE SHOWN IN THE DRAWINGS.)
- ※ APPLY GREASE WHEN ASSEMBLING THE O-RING. THE FOLLOWING PART IS NECESSARY FOR THE MODIFICATION.

NAME	CLUTCHABLE PTO ASS'Y	B.O.M.NO.
DRAWING NO.	7-36957-B	5Z03160

1. REMOVING THE MARINE GEAR PARTS

1) REMOVE THE SUPPLY COVER ASSEMBLY ⓒ, PIPE ⓑ, AND COVER ⓒ. (REFER TO FIG. 1.) WHEN REMOVING THE SUPPLY COVER ASSEMBLY ⓐ, ALSO REMOVE THE ADAPTER ⓘ. INSTALL THE REMOVED ADAPTER ⓙ AT POSITION ⓚ (HOUSING). (REFER TO FIG. 4.) WHEN REMOVING THE COVER ⓒ, PAY ATTENTION SO THAT THE INSTALLATION BOLT DOES FALL INTO THE MARINE GEAR. ALSO, SINCE THE PIPE PARTS ⓗ AND ⓖ WILL BE USED LATER, ENSURE THAT THEY ARE NOT LOST.
2) REMOVE THE BOLT, WASHER ⓓ AND PLUG ⓔ FROM THE VALVE ASSEMBLY Ⓑ INSTALLATION SURFACE (VIEW Z).

2. INSTALLING THE P.T.O. PARTS

SINCE THREEBOND WILL BE APPLIED TO THE SURFACE TO WHICH THE SUPPLY COVER ASSEMBLY Ⓔ AND P.T.O. SUB-ASSEMBLY Ⓖ WILL BE INSTALLED, ENSURE THAT IT IS CLEAN.

1) BEFORE INSTALLING THE SUPPLY COVER ASSEMBLY Ⓔ, READJUST THE SHIM SO THAT THE GAP IS -0.05 ~ +0.05mm. (REFER TO FIG.3)
2) APPLY THREEBOND (#1211) TO THE END COVER Ⓕ TO WHICH THE O-RING ⑨ WILL BE ASSEMBLED, AND INSTALL THE SUPPLY COVER ASSEMBLY Ⓔ.
3) INSTALL THE DRIVING RING ⑩, SNAP RING ⑪, THE NEEDLE BEARING ⑬ AND THEN SNAP RING ⑫ TO THE SPLINE OF THE DRIVE SHAFT.
4) APPLY THREEBOND (#1211) TO THE SUPPLY COVER ASSEMBLY Ⓔ, AND INSTALL THE PTO SUB-ASSEMBLY Ⓖ. WHEN DOING SO, CHECK THAT THE FIBER PLATE COMPLETELY ENTERS THE DRIVE RING. AT THIS TIME, SINCE THE PTO SUB-ASSEMBLY IS NOT COMPLETE, PAY ATTENTION SO THAT NO ACCIDENTS ARE CAUSED BY PARTS FALLING DURING THE INSTALLATION.
5) INSTALL THE SLEEVE PUMP ASSEMBLY ⑭.

3. VALVE ASSEMBLY INSTALLATION

1) INSTALL THE VALVE ASSEMBLY Ⓑ TOGETHER WITH THE GASKET ① TO THE SURFACE OF THE SPACER (FIG. 2). INSTALL THE GASKET AFTER CHECKING THE CONTACTING SURFACES.
2) APPLY THREEBOND (#1211) TO THE COVER ⓒ WHICH WAS REMOVED IN ITEM 1-1) AND INSTALL IT.
3) INSTALL THE PIPE ASSEMBLY ⑤ WITH THE JOINT SCREW ② AND GASKET COPPER ③. IN THE SAME WAY, INSTALL THE PIPE ASSEMBLY ④ WITH THE JOINT SCREW ⓐ, GASKET COPPER ③ AND ADAPTER ⓗ WHICH WERE REMOVED IN ITEM 1-1).

4. OPERATION CHECK

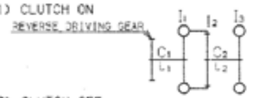
AFTER THE INSTALLATION, CHECK THE OPERATION WITH THE FOLLOWING PROCEDURE.

1) CONNECT THE PUMP TO THE PTO SHAFT.
2) CONNECT A 30 kgf/cm² PRESSURE GAUGE TO THE PTO CLUTCH OIL PRESSURE OUTLET.
3) IDLE THE MOTOR AND CHECK THAT THERE ARE NO OIL LEAKS.

TDI.NICO

MASS ELASTIC SYSTEM (SCALE 1:6)

(1) CLUTCH ON



INPUT SHAFT			DRIVING RING	CLUTCH	PTO SHAFT			SLEEVE
C1	L1	d	I1	I2	C2	L2	d	I3
0.52	0.160	0.048	0.017	0.018	0.25	0.138	0.034	0.001

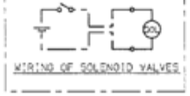
(2) CLUTCH OFF

INPUT SHAFT			DRIVING RING
C1	L1	d	I1
0.52	0.160	0.048	0.017

NOTES
1. ALL VALUES WERE CALCULATED.
2. MASS ELASTIC DATA DOSE NOT CONVERT TO ENGINE SPEED.
   Ii: MOMENT OF INERTIA (kg.m²)
   Ci: TORSIONAL RIGIDITY (MNm/rad)
   di: MIN. SHAFT DIA. (m)
   Li: ACTUAL SHAFT LENGTH (m)

SOLENOID VALVE	CLUTCH
ON	ON
OFF	OFF

OPERATING VOLTAGE
DC 24V / 1.5A



WIRING OF SOLENOID VALVE

NOTE
1. FIGURES IN THE DRAWING SHOW TIGHTENING TORQUE FOR MAIN IMPORTANT BOLTS.
2. MARKED Ⓟ SHOWS SEAT PACKINGS.
3. COAT LIQUID PACKING (THREEBOND #1211) ON THE PORTION MARKED Ⓛ AND ASSEMBLE THEM.
4. ADJUST SPACES Ⓢ FOR EACH SHAFT WITH SHIMS. SPACES Ⓢ SHOULD BE -0.05 ~ 0.05 mm.

OPTION KIT B.O.M. NO. 5Z03160

REV	BY	APPD.

REV	ZONE	CH. NO.	DATE	REV	ZONE	CH. NO.	DATE

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MATERIAL	-
HEAT TREAT	-
SURFACE TREATMENT	-
WEIGHT	XXXX kg
FIRST USE	
ASSY.	
MODEL MG-6557-00-00	
NAME	INSTALLATION DRAWING

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm
MACHINED DIMENSIONS
X ±0.75
X.X ±0.25
X.XX ±0.13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982

DATE	6-23-98
SCALE	1:2.5
DRN.	KASHIHARA
CHK.	K. Sato
APPD.	Y. Tanaka

METRIC
THIRD ANGLE PROJECTION
SIMILAR TO

HYDRAULIC DIAGRAM
3-49460-C

TWIN DISC INCORPORATED RACINE, WI 53403 - USA

7-37064-B

SHEET 1 OF 1 REV ---

#1021654 05/04

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